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INVESTIGATIONS OF WOODCOCK, SNIPE, AND RAILS IN 1954

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SUMMARY OF INVESTIGATIONS OF WOODCOCK, SNIPE, AND RAILS IN 1954

John W. Aldrich

U. S. Fish and Wildlife Service

The purpose of this annual compilation of reports on woodcock, snipe and rails is to aid investigators in keeping track of work other than their own that is being conducted in this field,and to attempt to call attention to the gaps in information necessary for the proper management of these migratory game birds.

Woodcock wintering ground studies.--Winter counts of woodcock with the use of dogs over the past 5 years by Reed and Goodrum (see their report beyond) indicate that this method may have good possibilities for obtaining an index to over-all wintering populations. It would help in the appraisal of this method if similar operations might be conducted simultaneously in a number of other study areas, including bottomland as well as upland habitats. Studies of winter habitat factors effecting these birds in progress under the auspices of the Louisiana Wild Life and Fisheries Commission should help to throw light on their distribution at that time. Obviously, the relative ability of the dogs used to locate the birds would be one of the greatest variables in this system. It would seem to be very important to use the same dogs in the same areas each year.

Banding of woodcock on their wintering grounds was conducted by the Louisiana Wild Life and Fisheries Commission. A total of 5627 woodcock had been banded in North America at all times of the year, but particularly in winter, and 255 of these had been retaken at the end of 1953.

Woodcock breeding ground studies.--Information continued to accumulate which will enable a more sound approach to obtaining information on the annual variation in abundance of woodcock on their breeding grounds. One of the most important mileposts in this advance was a statistical analysis of data obtained by cooperators in the annual singing ground counts over a 5-year period (Kozicky, Bancroft and Homeyer, Journal of Wildlife Management 18:259-266, 1954). These authors point out one of the most important weaknesses in the organization of the singing ground counts to date has been the lack of randomization in the selection of the routes, with its possibility of injecting a constant component of error, due to bias, which does not decrease as the number of routes is increased. It was recommended that further stratification of areas be attempted, based on knowledge of relative usage of these segments by woodcock and that a minimum of two routes be selected at random in each stratum to obtain unbiased estimates of sampling error. It was noted that since detailed banding studies are showing that woodcock frequently change singing grounds there appears to be little value in running the routes more than once each year. It was suggested that more routes

covering a greater sample of the total woodcock breeding range, run only once, might result in less sampling error than repeating counts over the same route if this necessitates covering less territory.

It is becoming apparent that the main weakness in our present effort to obtain a breeding ground index of woodcock abundance is that we are attempting to measure populations in areas of suitable habitat but without consideration of how much change is taking place in the total amount of this habitat. Our routes are laid out in such a way as to cover the largest amount of good woodcock habitat possible in the time available. In fact we have recommended that routes be changed when ecological succession advances to a stage unsatisfactory for woodcock breeding. This may turn out to be a reliable way of measuring woodcock population changes within the favorable habitats, but this is only half the job. It in no way measures the changing amounts of favorable habitat available from year to year. Studies are in progress under the auspices of the game departments of the states of Michigan, Pennsylvania and New York, and under the supervision of the Massachusetts and Maine Cooperative Wildlife Research Units to determine what constitutes habitat suitable for supporting breeding woodcock. The next step in improving our present system of appraising over-all changes in woodcock populations would seem to be to devise a way of determining the annual change in amount of suitable woodcock habitat. If we could obtain such an index of abundance of favorable habitat, together with an index of abundance of woodcock within the favorable habitat, we would have everything we need. The only alternative would seem to be to have a large number of routes distributed completely at random throughout the breeding range of the woodcock without any consideration being given to the occurrence of suitable habitat. In all probability in most areas this method would result in many routes being run without recording any woodcock. The most difficult problem would probably be to maintain cooperator interest sufficiently high to get enough routes run on this basis.

During 1954 a total of 193 routes were run in 17 states of the United States and 21 counts in 5 provinces of Canada. These counts which are summarized in the following papers were made possible by the cooperation of the game departments of the various states and provinces, wildlife research units at land-grant colleges in Maine, Massachusetts and Pennsylvania, the Wildlife Management Institute and the Royal Mounted Police in Canada, as well as many individuals.

The combined data for each state are presented in Table 1.

Table 1.--Woodcock singing ground count data by States, 1954

	Average birds per stop per trip 1953	Number of Routes	Total stops (all trips)	Total Birds (all trips)	Average birds per stop per trip 1954
Maine	0.77	59	1529	1247	0.82
New Hampshire	0.80	1	22	15	0.68
Vermont	1.05	9	204	232	1.14
Massachusetts	1.16	5	200	197	0.99
Connecticut	0.55	13	249	127	0.51
New York	0.94	7	177	139	0.92
New Jersey	0.88	4	96	52	0.54
Pennsylvania	0.60	25	684	511	0.75
Delaware	0.65	2	54	32	0.59
Maryland	0.41	1	15	11	0.73
North Carolina	0.28	7	191	31	0.16
West Virginia	0.66	9	223	152	0.68
Kentucky	0.08	3	72	27	0.38
Ohio	1.06	8	190	229	1.21
Michigan	0.87	36	944	1,000	1.06
Wisconsin	0.73	1	39	25	0.64
Minnesota	0.27	3	74	32	0.43
TOTALS		193	4,963	4,059	0.82

Snipe wintering ground studies.--Investigations of Wilson's snipe have centered largely on the Gulf coast because that is probably the region where the largest number of these birds winter within the United States. Chandler Robbins (see report beyond) continued his studies of methods of determining wintering abundance with the cooperation of several State Game Departments, Federal Game Management Agents and private observers. What had been thought at first to be indications of large increases of Wilson's snipe this year was, on more critical analysis, found to be a false impression. This is a good example of how total figures can be distorted by an exceptional count at one locality, and indicates the importance of noting the total number of areas or counts which show increases or decreases as well as the average size of these counts.

Of the various states taking part in snipe investigations, Louisiana appeared to be most active, not only in participating in the winter inventory studies but in banding these birds with the use of mist nets. Up to the end of 1953 the number of Wilson's snipe banded throughout the Continent, at all times of the year, totaled only 1213 and the number of recoveries and returns only 35. Obviously we have a long way to go before we can even get a rough idea of the migratory pattern of this species.

Snipe breeding ground studies.--Appraisal of snipe abundance and habitat on breeding grounds in western Canada was made by Chandler Robbins, and Leslie Tuck added further to our knowledge of the times and duration of winnowing behavior of this species in Newfoundland. These investigations are reported on in two papers appearing beyond. Information of both of these sorts will be essential if we are ever in a position to attempt to obtain an annual index of abundance of snipe on their breeding grounds. Tuck's observations seemed to indicate that post sunset counts included a large percent of the total birds present for a longer period than predawn counts, particularly if more than 3 birds are present.

Rail investigations.--Allen Smith, investigating sora populations (see paper beyond) further demonstrated the importance of knowing amount of habitat in appraising over-all populations, particularly when areas of suitable habitat are discontinuous and frequently separated by considerable areas of unsuitable terrain which is ignored in the counting effort. At the same time his data indicated that it is possible to have big changes in populations from year to year even in areas of habitat apparently suitable to this species.

The results of an important life history study of the sora and Virginia rails conducted at the University of Minnesota were published during the year: (Pospichal, L. B. and Marshall, W. H. "A Field Study of the Sora Rail and Virginia Rail in Central Minnesota." The Flicker, vol. 26(1):2-32, 1954).

Active work is still in progress on the clapper rail under the auspices of the New Jersey Department of Conservation and Economic Development. A major study of this species covering several years as a project of the Georgia Game and Fish Commission was published: (Oney, John "Final Report on Clapper Rail Survey and Investigation Study." Georgia Game and Fish Commission, Federal Aid Proj. Ga. W9R 1954). A study of the ecological distribution and nesting success of clapper rails in California was published during the year: (Zucca, J. J. "A Study of the California Clapper Rail." Wasmann Journal of Biology, vol. 12(2):135-153, 1954). A summary of band recoveries indicated a rather pronounced migration of northern Atlantic populations of the clapper rail to southern Atlantic coastal marshes to winter: (Stewart, R. E. "Migratory Movement of the Northern Clapper Rail." Bird-Banding, vol. 25(1):1-5, 1954). A total of 1324 clapper rails had been banded by the end of 1953 and 57 of these had been recovered. Of the 760 soras banded up to that time, 8 had been recovered, and only 1 Virginia rail had been recovered from the 537 banded.

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WINTERING WOODCOCK POPULATIONS IN WEST-CENTRAL LOUISIANA, 1953-54

Vincent H. Reid and Phil Goodrum

U. S. Fish and Wildlife Service

Woodcock inventory work was done in conjunction with quail studies on the longleaf pine forest lands of west-central Louisiana, from November 1, 1953 through February 1954. The inventories were made largely on National Forest lands in Vernon, Natchitoches and Rapides Parishes.

Method.--Bird dogs were used for the inventory work and a record was kept of the number of woodcock points made by the dogs and the time spent afield.

Inventory Data

Migration.--Woodcock began to show up in the coverts of west-central Louisiana the last week in October and the first week in November. James Leatherman of the U. S. Forest Service observed one bird 8 miles south of Alexandria, Rapides Parish, on October 25, 1953. Reid flushed one woodcock on the Evangeline Ranger District, Rapides Parish, on October 31, 1953. One bird was seen on November 1 and another on November 2 in the same general area on the Evangeline District. The bird found on November 2 was successfully netted and banded by John D. Newsom, biologist, of the Louisiana Wild Life and Fisheries Commission.

There was a noticeable general movement of birds into this area in the fifth week of November when the dogs averaged a woodcock point for each 1.6 hours afield. Except for the third and fourth week in December, when woodcock numbers appeared low, the counts were fairly uniform through the second week in February. Peak counts were made the first and third week in January when the dogs averaged a point per 0.7 and a point per 0.5 hours afield respectively. Peak counts in the winter of 1952-53 were made the fourth and fifth weeks in January; the dogs averaged a point per 0.7 and a point per 0.3 hours respectively for these weeks. Table 1 shows a summary of the inventory by weeks for the past 5 winters in west-central Louisiana.

The best individual count was made on January 13, 1954 when the dogs averaged a woodcock point per 0.4 hours (24 minutes) of work. The best count in 1952-53 was made on January 25 when the dogs averaged a point per 0.11 hours (7 minutes) afield. Table 2 shows the dates of the highest woodcock counts for the past five winters.

Table 1.--Hours per Woodcock Point by Weeks for the Winters 1949-50 through 1953-54

Weeks	1949-50	1950-51	1951-52	1952-53	1953-54
			Hours per Point		
Nov. 1st week	-	-	-	4.00	3.0
2nd week	-	-	7.5	3.75	5.0
3rd week	-	-	-	-	-
4th week	-	4.7	2.0	2.0	3.3
5th week	-	6.0	1.5	-	1.6
Dec. 1st week	0.8	2.6	12.5	13.75	1.9
2nd week	1.1	1.4	3.5	-	1.6
3rd week	1.3	2.3	5.6	1.4	14.5
4th week	0.8	-	4.6	1.8	6.0
Jan. 1st week	0.6	-	2.6	1.5	0.7
2nd week	1.4	4.5	2.4	1.5	1.9
3rd week	0.8	0.5	0.6	-	0.5
4th week	2.5	1.1	3.0	0.7	1.2
5th week	1.3	0.6	2.3	0.3	-
Feb. 1st week	0.4	1.3	2.7	5.0	2.7
2nd week	-	-	1.6	1.0	2.5

Table 2.--Dates of Highest Woodcock Counts with Bird Dogs, Winters 1949-50 through 1953-54

Winter	Date Highest Count	Hours per Woodcock
1949-50	Feb. 5, 1950	0.33 (20 minutes)
1950-51	Jan. 15, 1951	0.25 (15 minutes)
1951-52	Jan. 17, 1952	0.25 (15 minutes)
1952-53	Jan. 25, 1953	0.11 (7 minutes)
1953-54	Jan. 13, 1954	0.4 (24 minutes)

An effort was made to locate woodcock in March, April and May but few adult birds were found. In 10.25 hours during March the dogs found three adult birds. In 14 hours in April, the dogs found one adult bird and 4 young. And in 7.08 hours in May no woodcock were found. Few woodcock were found in these months. Those present were probably breeding birds.

Summary for Winter Counts.--For the period November 1, 1953 to February 25, 1954 a total of 232 hours were spent in the field with dogs and 120 woodcock points were made. For this period the dogs averaged a woodcock point per 1.9 hours afield. The inventory figures indicate that fewer birds wintered in this area than in 1952-53 when the dogs averaged a point per 1.2 hours of work. Table 3 summarizes the counts for the past five years. In the winters 1953-54 and 1951-52 the dogs averaged a point for about each two hours afield during the winter months. In the winters 1949-50, 1950-51, and 1952-53, the dogs averaged a point for about each hour spent afield.

Table 3.--Hours per Woodcock Point for the Winters 1949-50 to 1953-54 in the Longleaf Pine Area of West-central Louisiana.

Winter	Hours Afield with Bird Dogs	Hours per Woodcock Point
1949-50	129.5	1.1
1950-51	166.5	1.1
1951-52	273	2.1
1952-53	223.3	1.2
1953-54	232	1.9

Discussion.--The fact that fewer birds were found in the piney woods this past winter does not necessarily reflect an over-all decreased woodcock population. Observations have indicated that fall and winter rains are important in conditioning the piney woods section as favorable woodcock habitat. Fall and winter rains were light in 1953-54 (14.83 inches) as they were in 1951-52 (11.25 inches) and dogs only averaged a point per two hours afield in these years. When the winter rains totaled greater than 18 inches as was the case in 1949-50, 1950-51 and 1952-53, the dogs averaged a point for about each hour afield. In the drier winters, the soil in the post oak flats and blackjack hillsides scattered through piney woods was dry and hard packed, and woodcock were seldom found using these areas. In the more moist winters, these soils were wet and made favorable woodcock feeding areas; in the more moist years woodcock use this type habitat and higher woodcock counts were obtained. Table 4 compares fall and winter precipitation totals with the average number of woodcock points per hour for counts made from 1949-50 to 1953-54.

Table 4.--Precipitation in Inches as Recorded at the Leesville, La. Weather Station and Woodcock Inventory Figures for the Winters, 1949-50 through 1953-54

Winter	Months						Hours per Woodcock Point
	Oct.	Nov.	Dec.	Jan.	Feb.	Total	
1949-50	7.74	0.28	8.69	5.23	10.27	32.21	1.1
1950-51	1.71	2.47	1.82	10.82	1.98	18.80	1.1
1951-52	0.16	3.07	3.86	2.91	1.25	11.25	2.1
1952-53	0.00	7.01	6.11	1.86	7.31	22.29	1.2
1953-54	1.52	3.81	6.61	2.37	0.52	14.83	1.9

SUMMARY

1. The first woodcock was noted on October 25, 1953.

2. There was a general movement of birds into the area the fifth week in November and except for the third and fourth week in December the counts remained fairly uniform through mid-February.

3. Peak counts were made the first and third weeks of January with the dogs averaging a point per 0.7 hours and a point per 0.5 hours respectively.

4. The highest individual count in the 1953-54 season was made on January 13 when the dogs averaged a point per 24 minutes.

5. An effort was made to locate woodcock during March, April and May. The dogs worked 31.3 hours and found 4 adult birds. An adult female with a brood of 4 was found April 1, 1954 on the Kisatchie National Forest in Natchitoches Parish.

6. Fewer woodcock were found in 1953-54 than in 1952-53. In the period November 1, 1953 to February 25, 1954 the dogs worked 232 hours and found 120 woodcock. They averaged a point per 1.9 hours for this period. In the winter of 1952-53 the dogs averaged a point per 1.2 hours.

7. Fall and winter rains were lighter in 1953-54 than in 1952-53. As a result there was less favorable woodcock feeding area in this piney-woods region.

8. The fact that there was less moisture and consequently fewer favorable feeding places for woodcock in this area probably accounts for the fewer number of birds found during the inventory work in 1953-54. A lesser amount of precipitation with resulting reduction in favorable feeding area seems to be correlated with the number of woodcock recorded during the investigations.

WOODCOCK SINGING GROUND COUNTS IN CANADA - 1954

R. D. Harris

Canadian Wildlife Service

Counts of singing male woodcock were again carried out in Ontario, Quebec, New Brunswick, Nova Scotia and Prince Edward Island. Cooperators in the survey included representatives of the Canadian Wildlife Service, the Wildlife Management Institute, Provincial Game Departments, Officers of the R. C. M. P. and volunteers.

Woodcock survey methods have been changed slightly in areas of high woodcock density to conform with the methods used in the north-eastern United States. Unfortunately some areas formerly surveyed do not lend themselves to the new techniques in that the birds are too thinly and irregularly dispersed. Necessary use of two techniques makes reporting difficult. The new methods are so designed that the results can be treated statistically - an important factor where a large amount of data must be analyzed. With sufficient data changes can now be classified as significant or not. For comparison of data obtained by the two methods see Table 1.

Ontario

The number of singing male woodcock counted in Ontario was down slightly from the number counted in 1953, and 21.2% less than the long-term average. Some new regions were reported from and comparable data are not available for these.

New Brunswick

In the Sackville, St. John, Moncton and Tabusintac regions, the count was down from that of 1953. The 1954 change from the long-term average amounted to -26%. The new method used in the Fredericton region for the second year indicated a decrease of singing males of 24%.

Nova Scotia

There was no change in numbers of woodcock counted in Nova Scotia this year compared to last year but the count was up 17% over the average.

Prince Edward Island

An increase of 6.7% was shown in singing male woodcock over the long-term average.

Table 1. Woodcock singing ground counts in Canada, 1954

Region	Census Area	1953	1954	No. of Years	Long Term Aver.	Change from Average	Observer
Ontario							
Ottawa	Stittsville	12	8	3	10.0		V.E.F.Solman
	Old Chelsea	2	3	3	3.0		R.D.Harris
	Vars	3	5	12	6.8		V.E.F.Solman
	Carp #1	0	1	9	2.9		" "
	Carp #2	3	3	3	2.7		W.E.Godfrey
Kingston	Cataraqui	1	-	6	-		Geo.M.Stirrett
	Westbrook	1	1.6	6	3.1		" " "
	Perth Rd.	3	1	6	1.4		" " "
	Holleford	4	1.5	6	3.7		" " "
Comparable Totals		29	24.1		30.6	-21.2%	
New Brunswick							
Sackville	Rockport Rd.	9	5	5	0.3		Geo.F.Boyer
	Cookville Rd.	6	6	2	6.0		" " "
	Aulac	5	0	2	2.5		" " "
	Pineville	9	-	2	9.0		-
St. John	Tilley Rd.	19	19	17	29.2		B.C.Carter
Moncton	Turtle Creek	25	19	7	32.0		Geo.F.Boyer
Tabusintac	Price Settl.	13	21	14	14.6		B.C.Carter
Comparable Totals		77	70		94.6	-26.0%	
Nova Scotia							
Truro	Camden Rd.	7	7	5	5.8	+17%	Geo.F.Boyer
P.E.I.							
	Avondale	4	11	6	8.3		A.M.Johnson
	Fortune	18	-	13	10.7		" "
	French Village	4	8	13	8.4		" "
	Conway	25	19	13	13.1		" "
Comparable Totals		33	38		35.6	+ 6.7%	

New Method			No. of Stops Per Trip	Av. No.of Birds Per Trip		Av.Birds Per Stop Per Trip	Observer
Province	Census Route	County					
Ontario						1954*	
	Hungerford	Hastings	10	6.3		0.6	H.G.Lumsden
	Elzevir #1	"	10	8.6		0.9	" "
	Elzevir #2	"	14	4.0		0.3	" "
	Westbrook	Frontenac	9	3.3		0.4	G.M.Stirrett
	Perth Rd.	"	7	1.0		0.1	" "
	Holleford	"	8	1.0		0.1	
Totals			58	24.2		0.4	
New Brunswick					1953	1954	
	Richibucto Rd.		10	17.6	2.5	1.8	B.S.Wright
	Kingsley Bridge		10	10.0	1.3	1.0	" "
	Charters Settl.		10	11.7	1.4	1.2	
Totals			30	39.3	1.73	1.31	

Decrease of 26% shown for New Brunswick

* First survey in Ontario using the new method

WOODCOCK CENSUS STUDIES IN NORTHEASTERN UNITED STATES - 1954

Howard L. Mendall

Maine Cooperative Wildlife Research Unit

The 1954 woodcock census data for the New England States and New York were compiled by the writer who again served as coordinator for the northeastern region.

Changes in census techniques were initiated last year whereby a sample, rather than a complete count, was obtained on each census route. By this method the population index is taken as the number of woodcock per stop per route. The 1953 data could not be compared with previous figures, but permitted the establishment of a base for use in 1954 and in succeeding years.

An examination of the 1953 and 1954 data indicate that there has been no change whatsoever in the trend of the woodcock population of the northeast. In dealing with figures of the quantity that were available, it is difficult to conceive that the totals could run as close as they did. A slight increase in Vermont was offset by a slight decrease in Massachusetts. In Maine, Connecticut, and New York, no significant change was apparent, while the New Hampshire data were based on a very small sample.

The complete results of this year's studies are given in Table 1. To permit comparison of individual areas the 1953 index figure is also listed for each census route which was covered in both years.

An explanation should be made as to the coordinator's method of evaluating the various census reports. In past years only one final population figure per route had been given, i.e. what was considered as the probable population for a particular route on the basis of the several trips made. This year all stops and all birds are totaled for all of those censuses taken which were considered as containing normal data. This change in presenting the findings was made so that northeastern results could be correlated with results obtained elsewhere.

It was necessary to exercise a certain amount of judgment in considering individual reports. Although a minimum of 3 census trips per route was requested, the number actually taken varied from 1 to 5. It was apparent that some cooperators made very early or very late checks as "test runs." Counts were not used by the coordinator if it appeared likely that migration might still have been in progress, or if the season was so far advanced that courtship activity was noticeably declining. If two counts were made on successive nights, or with only one intervening night, one of these counts ordinarily was eliminated. Censuses made during the period of the full moon or under adverse weather conditions were likewise excluded. Reports based upon only one census count were not used.

Thus the data for any individual area, shown in Table 1, are based upon either two or three census trips per route, depending upon circumstances.

The tabulated summary by states contains more data (and in some cases a higher population index) than is shown in Table 2. This is because of the fact that a number of new census routes were established this spring; in several instances these had a very high density of breeding birds. Such data, of course, will not be available for comparative purposes until 1955.

The increase in new census areas is very gratifying. New York and Maine were especially active this season in this respect. Maine now has a total of 59 census routes.

Table 2 gives the comparative tabulations by states for 1953 and 1954. These are the total figures for all routes which were censused in both years. As previously pointed out, this sample shows no change in the breeding population of woodcock in the region.

Recommendations

As a result of this year's studies and ensuing correspondence with various census cooperators, the following suggestions are made:

1. Changes in census routes. Several cooperators in Vermont, Massachusetts, and Connecticut have pointed out that on some of their long-established routes changing cover conditions have now resulted in rather poor habitat for woodcock. The writer also has observed this in eastern Maine. Under such conditions it would seem desirable to discontinue some of the present routes and to substitute new ones.

2. Effect of adverse weather and full moon. Further data on this point were obtained this year in Maine by Claude Westfall on the Greenbush area and by the writer in Washington County. It appears that the present 6-day postponement of census work at the time of the full moon may be cut to 4 days (2 days before full moon, the day of full moon, and one day after). This gain of even two days at each full moon period would be of considerable importance in a spring such as this when adverse weather was so prevalent. Regarding other weather effects, it is suggested that no change be made from the present instructions.

Census Organization

Within the several states the 1954 census studies were organized by the following:

Maine: by W. R. De Garmo, Maine Department of Inland Fisheries and Game, and by the writer. Special assistance in eastern Maine was given by John Dudley, Louis Beckett, and by personnel of the Moosehorn National Wildlife Refuge.

New Hampshire: by Fred Scott, New Hampshire Fish and Game Department

Vermont: by Roger Seamans, Vermont Fish and Game Service, with Ralph Minns, U. S. Fish and Wildlife Service, handling the Highgate and Swanton areas.

Massachusetts: by William Sheldon, Massachusetts Cooperative Wildlife Research Unit, assisted by Russell Norris, U. S. Fish and Wildlife Service, on the Newburyport area.

Connecticut: by Mason Belden, Connecticut Board of Fisheries and Game.

New York: by Charles Brown, New York Conservation Department.

Table 1.--Woodcock Census Studies in the Northeast - 1954

State	Census Route	County	1953 Av. No. birds per stop per trip	1954 Total stops all trips	1954 Total birds all trips	1954 Av.No. birds per stop per " trip	Observer in 1954
Me.	Leeds	Androscoggin	--	27	17	0.6	N.Fellows
Me.	Ashland	Aroostook	1.0	22	18	0.8	H.Carson
Me.	Oxbow	Aroostook	0.5	39	35	0.9	H.Carson
Me.	Wade	Aroostook	0.6	18	7	0.4	H.Carson
Me.	Island Falls	Aroostook	0.8	27	12	0.4	F.Dunn
Me.	Moro	Aroostook	--	24	20	0.8	F.Dunn
Me.	Hodgdon	Aroostook	0.6	24	17	0.7	H.Mendall
Me.	Harrison	Cumberland	--	24	22	0.9	N.Fellows
Me.	Coplin	Franklin	0.7	30	20	0.7	H.Spencer
Me.	Salem	Franklin	0.8	24	24	1.0	H.Spencer
Me.	Amherst	Hancock	1.0	30	30	1.0	D.Holmes
Me.	Orland	Hancock	0.9	30	23	0.8	R.Parks
Me.	Bar Harbor	Hancock	1.0	21	18	0.9	R.Parks
Me.	Trenton	Hancock	1.1	30	34	1.1	R.Parks
Me.	Lamoine	Hancock	0.6	16	19	1.2	R.Parks
Me.	Gouldsboro	Hancock	1.1	24	15	0.6	R.Parks
Me.	Gardiner	Kennebec	0.8	30	24	0.8	W.Harris
Me.	Togus Pond	Kennebec	0.2	33	9	0.3	J.Maasen
Me.	Readfield	Kennebec	--	20	20	1.0	W.DeGarmo
Me.	Belgrade	Kennebec	--	33	29	0.9	W.DeGarmo
Me.	St.George	Knox	0.4	30	25	0.8	J.Maasen
Me.	Hiram	Oxford	0.4	24	3	0.1	C.Banasiak
Me.	Albany	Oxford	--	14	20	1.4	N.Fellows
Mc.	Greenbush	Penobscot	1.8	30	52	1.7	C.Westfall
Me.	Alton	Penobscot	0.8	24	39	1.6	N.Schlaack
Me.	Orono	Penobscot	0.3	22	6	0.3	R.Toth
Me.	Kenduskeag	Penobscot	--	30	23	0.8	D.Holmes
Me.	Kingman	Penobscot	1.8	27	47	1.7	G.Aiken

Table 1 continued

State	Census Route	County	1953 Av. No. birds per stop per trip	1954 Total stops all trips	1954 Total birds all trips	1954 Av. No. birds per stop " trip	Observer in 1954
Me.	Enfield	Penobscot	1.2	16	16	1.0	G.Aiken
Me.	Chester	Penobscot	0.4	30	12	0.4	G.Aiken
Me.	Mt. Chase	Penobscot	0.7	30	21	0.7	F.Dunn
Me.	Williamsburg	Piscataquis	0.7	27	17	0.6	M.Smart
Me.	Atkinson	Piscataquis	--	27	22	0.8	M.Smart
Me.	Milo	Piscataquis	0.6	30	16	0.5	M.Smart
Me.	T4R10	Piscataquis	1.2	10	19	1.9	H.Taylor
Me.	Trout Brook	Piscataquis	--	18	20	1.1	M.Scott
Me.	Bowdoinham	Sagadahoc	--	21	25	1.2	E. Baker
Me.	Topsham	Sagadahoc	0.8	18	19	1.1	E.Baker
Me.	New Portland	Somerset	0.4	30	10	0.3	H.Spencer
Me.	Madison	Somerset	0.8	39	23	0.6	J.Hunt
Me.	Concord	Somerset	0.8	36	22	0.6	J.Hunt
Me.	Jackman	Somerset	--	42	34	0.8	J.Hunt
Me.	Sandy Point	Waldo	0.6	27	16	0.6	D.Holmes
Me.	Montville	Waldo	--	48	32	0.7	J.Maasen
Me.	Calais	Washington	1.2	15	7	0.5	H.Mendall
Me.	Charlotte I	Washington	1.7	48	47	1.0	H.Mendall
Me.	Charlotte II	Washington	1.1	24	29	1.2	H.Mendall
Me.	Meddybemps I	Washington	1.2	15	27	1.8	H.Mendall
Me.	Meddybemps II	Washington	0.5	18	6	0.3	H.Mendall
Me.	Cooper	Washington	1.0	16	14	0.9	H.Mendall
Me.	Alexander	Washington	0.6	15	16	1.1	J.Dudley
Me.	Edmunds I	Washington	0.9	27	13	0.5	E.Clark
Me.	Edmunds II	Washington	0.3	27	23	0.9	A.Davis
Me.	Edmunds III	Washington	0.3	21	10	0.5	A.Davis
Me.	Jonesboro	Washington	1.3	22	22	1.0	H.Blanchard
Me.	East Machias	Washington	0.7	33	29	0.9	H.Blanchard
Me.	Machias River	Washington	1.1	27	19	0.7	H.Blanchard
Me.	Limerick	York	--	27	16	0.6	C.Banasiak
Me.	Lyman	York	--	18	17	0.9	C.Banasiak
N.H.	Pittsburg	Coos	0.9	22	15	0.7	F.Scott
Vt.	Ripton	Addison	1.1	24	42	1.8	R.Fuller
Vt.	Starksboro	Addison	--	30	23	0.8	R.Fuller
Vt.	Granville	Addison	0.9	30	24	0.8	H.Colton
Vt.	Victory	Essex	1.7	18	36	2.0	R.Seamans
Vt.	Waterford	Essex	1.1	24	30	1.3	R.Seamans
Vt.	Highgate	Franklin	1.0	10	20	2.0	R.Minns
Vt.	Swanton	Franklin	1.0	14	18	1.3	R.Minns
Vt.	Shrewsbury	Rutland	1.0	30	32	1.1	H.Colton
Vt.	Halifax	Windham	0.8	24	7	0.3	R.Seamans
Mass.	Prescott	Worcester	1.0	84	78	0.9	W.Sheldon
Mass.	Gate 40-Quabbin	Worcester	1.0	48	36	0.8	W.Sheldon
Mass.	MDC-Quabbin	Worcester	1.2	30	30	1.0	W.Sheldon
Mass.	Leverett	Franklin	1.5	24	30	1.3	W.Sheldon

Table 1 continued

State	Census Route	County	1953 Av. No. birds per stop per trip	1954 Total stops all trips	1954 Total birds all trips	1954 Av. No. birds per stop per trip	Observer in 1954
Mass.	Newburyport	Essex	1.8	14	23	1.6	R.Norris
Conn.	Glastonbury	Hartford	0.5	16	7	0.4	M.Belden
Conn.	Barkhamsted II	Hartford	0.6	30	16	0.5	A.Lamson
Conn.	Farmington	Hartford	0.5	18	13	0.7	R.Pillard
Conn.	Canaan	Litchfield	0.8	18	11	0.6	W.Sondrini
Conn.	Litchfield I	Litchfield	0.8	18	10	0.6	R.Pillard
Conn.	Litchfield II	Litchfield	0.7	18	9	0.5	R.Pillard
Conn.	Portland I	Middlesex	0.8	18	6	0.3	M.Arnold
Conn.	Portland II	Middlesex	0.4	21	10	0.5	M.Arnold
Conn.	No.Branford	New Haven	0.5	18	8	0.4	O.Beckley
Conn.	Guilford	New Haven	0.8	18	17	0.9	O.Beckley
Conn.	Shenipsit II	Tolland	0.4	14	7	0.5	M.Belden
Conn.	Shenipsit III	Tolland	0.1	21	4	0.2	M.Belden
Conn.	Eastford	Windham	0.6	21	9	0.4	F.McCamey
N.Y.	Berne	Albany	0.8	12	14	1.2	C.Brown
N.Y.	Bethlehem	Albany	0.7	24	25	1.0	R.Smith
N.Y.	Westerlo	Albany	0.7	27	19	0.7	R.Carl
N.Y.	Guilderland	Albany	0.9	24	7	0.3	J.Reilly
N.Y.	New Hudson	Allegany	--	18	10	0.6	R.Hyde
N.Y.	No. Harmony	Chatauqua	--	33	16	0.5	R.Willsie
N.Y.	Pharsalia-	Chenango	--	24	33	1.4	P.Kelsey
N.Y.	Ticonderoga	Essex	--	26	25	1.0	G.Davis
N.Y.	Wilmington	Essex	--	33	49	1.5	G.Chase
N.Y.	Franklin	Franklin	--	20	43	2.2	G.Chase
N.Y.	Indian Lake	Hamilton	1.2	16	14	0.9	C.Brown
N.Y.	Lysander	Onondaga	--	30	61	2.0	M.Alexander
N.Y.	Poestenkill	Rensselaer	--	12	9	0.8	R.Smith

1954 Summary by States - All Data

	Total stops all trips	Total birds all trips	Av. No. birds per stop per trip
Maine	1529	1247	0.82
New Hampshire	22	15	0.68
Vermont	204	232	1.14
Massachusetts	200	197	0.99
Connecticut	249	127	0.51
New York	299	325	0.92
Totals	2503	2143	0.86

Table 2.--Comparative Census Data by States, 1953 and 1954
(Only routes censused during both years)

State		Total stops all trips	Total birds all trips	Av. No. birds per stop per trip
Maine	1953	1138	906	0.80
	1954	1156	930	0.80
New Hampshire	1953	16	14	0.88
	1954	22	15	0.68
Vermont	1953	206	216	1.05
	1954	144	185	1.28
Massachusetts	1953	207	240	1.16
	1954	200	197	0.99
Connecticut	1953	254	147	0.58
	1954	249	127	0.51
New York	1953	69	55	0.80
	1954	103	79	0.77
Totals	1953	1890	1578	0.83
	1954	1874	1533	0.82

WOODCOCK SINGING GROUND COUNTS IN CENTRAL-EASTERN UNITED STATES, 1954

P. F. English

Pennsylvania State University

Personnel of the following agencies aided in the gathering of woodcock breeding ground data in 1954:

Board of Game and Fish Commissioners, Dover, Delaware.
Game and Inland Fish Commission, Baltimore 2, Maryland.
Wildlife Resources Commission, Raleigh, North Carolina.
Department of Conservation and Economic Development, Trenton 7, New Jersey.
Department of Natural Resources, Columbus, Ohio.
Pennsylvania Game Commission, Harrisburg, Pennsylvania.
Pennsylvania State University, Department of Zoology, State College, Pennsylvania.
Conservation Commission, Charleston, West Virginia.
Department of Fish and Wildlife Resources, Frankfort, Kentucky.

It is to be noted here that Pennsylvania initiated 13 new census routes in 1954. These are in addition to those added in 1953 and which were run again in 1954. Pennsylvania now appears to have very good coverage on breeding woodcock populations.

Maryland ran two counts in 1953, but the Drum Point route was discontinued as it is now a residential area.

West Virginia established one new route and abandoned two old ones which seemed non-productive; one route missed in 1953 was resumed this year.

Ohio ran only seven counts in 1953.

Kentucky ran new routes and found low populations.

All data obtained in this region are presented in Table 1.

A comparison is made between total counts by states for 1953 and 1954 in Table 2.

Table 1.--Woodcock Census Areas Maintained by Cooperators
Report for 1954 compared with 1953, unless otherwise indicated.

State	Census Area	County	No. Occupied Singing Grounds		Observers
			1953	1954	1954
Del.	Petersburg	Kent	4	5	E.B.Chamberlain
Del.	Golts	New Castle	8	6	Burd S.McGinnes
Md.	Pocombe River #1	Worcester	8	4	Geo.A.Jones
N.C.	New Hope Farm #1	Chatham	10	3	D.J.Hankla
N.C.	Glen Alpine to Power Plant #2	Burke	1	0	Ed.R.Smith,Jr.

Table 1 continued

State	Census Area	County	No. Occupied Singing Grounds 1953	No. Occupied Singing Grounds 1954	Observers 1954
N.C.	Southern R.R. Tracks #3	Burke	2	2	Ed.R.Smith,Jr.
N.C.	Highway 70 #4	Burke	1	0	Ed.R.Smith,Jr.
N.C.	Old N. Main Street #5	Henderson	5	3	Rex L. Bird
N.C.	Tracy Grove Road #6	Henderson	2	3	Rex L. Bird
N.J.	Archer Cr. Colliers Mills #1	Ocean	2	2	Paul D.McLain
N.J.	Tuckahoe Area #2	Atlantic	7	6	Fred Ferrigno
N.J.	Walpack-Bevaus #3	Sussex	6	5	Russell A.Spinks
N.J.	Haleysville P.S.Grds #4	Cumberland	5	4	E.G.Bevan
Pa.	Barrens #1	Centre	2	3	Mr.Mrs.P.F.English
Pa.	Stone Valley #2	Huntingdon	8	11	Mr.Mrs.P.F.English
Pa.	Bald Eagle #3	Centre and Blair	8	9	W.C.Richter
Pa.	Port Matilda #4	Centre	7	14	S.A.Liscinsky
Pa.	Martha Furnace #5	Centre	8	8	S.A.Liscinsky
Pa.	Julian #6	Centre	5	5	C.R.Studholme
Pa.	Unionville #7	Centre	7	6	C.C.Purnell
Pa.	Atkinson Mills #8	Mifflin	6	5	J.W.Taylor
Pa.	Mifflin #9	Juniata	2	4	W.B.Taylor
Pa.	Upper Strasburg #10	Franklin	6	3	Glen L.Bowers
Pa.	New Bloomfield #11	Perry	2	2	H.A.Roberts
Pa.	New Germantown #12	Perry	4	3	H.A.Roberts
Pa.	Ardara #13	Westmoreland		4*	J.Liss
Pa.	Neff Mills #14	Huntingdon		6*	E.E.Birth
Pa.	Blooming Grove #15	Pike		9*	A.J.Kriefski
Pa.	Linesville #16	Crawford		9*	Ray Sickles
Pa.	Pittsfield #17	Warren		6*	Elton Barton
Pa.	Clarendon #18	Warren		4*	Ivan M. Warner
Pa.	Penn Run #19	Indiana		4*	R.L.Snyder
Pa.	Thornhurst #20	Lackawanna		13*	Steve Kish
Pa.	Freeland #21	Luzerne		11*	Steve Laputka
Pa.	Geneva #22	Crawford		4*	E.Decker and Hank Pratt
Pa.	Emlenton #23	Venango		4*	E. and C.L.Decker
Pa.	McKean #24	Erie		9*	C.W.Harned
Pa.	Mount Royal #25	York		1*	Emil Lesko
Pa.	Betula #26	McKean		12*	W.H.Shirey
W.Va.	Kumbrabow Forest #1	Randolph	7	3	John Gill
W.Va.	Bayard-Henry #2	Grant	9	9	David Gilpin
W.Va.	Along Thorny Creek #3	Pocahontas	2	3	Hans Uhlig
W.Va.	Cranberry Road #4	Pocahontas		2*	R.W.Bailey
W.Va.	Mt.Tabor Road #5	Raleigh	4	3	R.C.Kletzly
W.Va.	Old Town to Igloo #6	Mason	6	6	H. and A.Dahl
W.Va.	State Route 32 #7	Tucker	2	9	James Beach
W.Va.	Routes 19 and 41 #8	Nicholas		6**	K.H.Anderson

Table 1 continued

State	Census Area	County	No.Occupied Singing Grounds 1953	1954	Observers 1954
Ohio	Rt. #1 Austinburg	Ashtabula	6	13	M.D. and M.C. Gilfillan
Ohio	Rt. #2 Dorset	Ashtabula	7	9	M.L.,M.D. and M.C.Gilfillan
Ohio	Rt. #3 Morgan	Ashtabula	6	5	M.D. and M.C. Gilfillan
Ohio	Rt. #4 Andover	Ashtabula	12	12	M.L.,M.D. and M.C.Gilfillan
Ohio	Rt. #5 Ashtabula	Ashtabula	20	22	M.D. and M.C. Gilfillan
Ohio	Rt. #6 Franklin	Portage	4	2	Ralph W. Dexter, Ann Itarbourt, H. Raup
Ohio	Rt. #8 Castalia	Erie	65	14	R.Gettell
Ky.	Sand and Hendrich Rd.#1	Bath	2	1	J.F.Storner
Ky.	Sloans X Pond Rd. #2	Edmonson		7*	Dan M. Russell and John Sincock

* Newly established stations in 1954.
** Not run in 1953, count in 1952 was 3.

Table 2.--A Comparison of Woodcock Census Data for 1953-1954

State	1953 Count	1954 Count	Change
Delaware	12	11	-1
Maryland	11[1.]	4[2.]	-7
N. Carolina	23	11[3.]	-12
N. Jersey	20	17	-3
Ohio	60[4.]	77[5.]	+17
Pennsylvania	68	73	+5
West Virginia	36	35	-1
Kentucky	2[2.]	8[1.]	+6

1. Two stations
2. One station
3. One line less
4. Seven lines
5. Seven lines, one not counted in 1953.

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WOODCOCK INVESTIGATIONS IN THE CENTRAL-NORTHERN UNITED STATES - 1954

John W. Aldrich

U. S. Fish and Wildlife Service

The total number of breeding ground counts made in the central northern states of Michigan, Wisconsin, and Minnesota increased again this year from 37 to 40. The routes now run in this region are certainly not distributed in proportion to the amount of woodcock producing habitat. It is hoped that the need for better coverage will be appreciated and that added effort will be made to run additional routes, particularly in the better woodcock producing areas of Wisconsin and Minnesota.

Data for all routes run in the three central-northern states of Michigan, Wisconsin and Minnesota in 1954 are presented in Table 1. The inclusive dates shown for each route allow evaluation of the data as to whether they represent breeding birds or not.

In Table 2, the data are totaled for each state and a grand total of 1.000 woodcock per stop per trip in all three of the central-northern states was arrived at. This is a 22.4 percent increase over the average of 0.776 birds per stop per trip for this region in 1953. The significance of this increase was supported by increases in a big majority of the individual counts. All but 6 of the 40 counts showed increases. Half of the decreases resulted from 3 of the 4 counts in Wisconsin and Minnesota.

It will be necessary to get many more counts run in Wisconsin and Minnesota before we can say that we are even beginning to sample the suitable woodcock habitat in the central-northern region.

Table 1.--Woodcock breeding ground counts in Central-Northern States - 1954

Locality of route	Observer	Total birds heard all trips	Total No.of stops all trips	Av.No. birds per stop per trip	Incl. dates	1953 Av.No. birds per stop per trip	Change
Michigan							
Alger Co.,Shingleton	Tony and Thelma Peterle [Repeat]	29	33	.879	5/10-5/13	.566	+ .313
Allegan Co.,Ely L.Rd.#1 Allegan T2N-R15W	Charles E. Friley, Jr. [Repeat O.L.Hougen 1953]	6	27	.222	5/6-5/13	.062	+ .160
Allegan Co., Gables Corn.#2 Allegan T2N-R15W	Charles E. Friley, Jr. [Repeat O.L.Hougen 1953]	6	18	.333	5/6-5/13	.133	+ .200
Allegan Co. T3N-R15W #3 Allegan	Charles E. Friley, Jr. [new route]	7	24	.292	5/7-5/14		
Barry Co. Middleville	Charles F. Storkan [new]	33	30	1.100	4/13-5/7		
Chippewa Co. #1 Johnswood	L. G. Schemenauer [Repeat]	51	30	1.700	5/6-5/8	1.433	+ .267
Chippewa Co. #2 Brimley T47N R5W	Pete and Elsie Drake [new]	20	38	.526	5/16-5/25		
Chippewa Co. #3 Dunbar Forest Exp.Sta. T47N R1E	R. J. Marty [new]	8	16	.500	5/10-5/13		
Clinton-Shiawassee Rose Lake Exp. Sta.	Lytle H. Plankenship [Changed from 1953]	34	24	1.417	4/22-5/6		
Clinton Co. East Lansing	William H. Goudy [new]	36	21	1.714	4/23-4/29		
Delta-Marquette Cornell T42N-R24W;T41N-R24W	C.T.Dubovsky [new]	27	36	.750	5/12-5/16		

Dickinson Co. Sagola	Marie DeGayner [new]	29	18	1.611	5/24-5/26	1.381	+ .230
Gladwin Co. Gladwin T18N, R1W	A. Gene Gazlay [M.Gazlay]	43	33	1.303	4/22-5/8	.758	+.545
Gratiot Co.,Gratiot-Saginaw Game Area	Lytle H. Blankenship [Repeat of 1953]	52	30	1.733	4/23-5/10	1.067	+ .666
Houghton Co., Sidnaw	R. R. Rafferty [repeat]	24	21	1.143	5/11-5/13	1.095	+ .048
Huron Co. Bad Axe	Charlot Braden [new]	41	27	1.519	4/21-5/6		
Ingham Co. #3 Dansville State Game Area #3	D. W. Douglass [repeat 1953-W.Goudy]	13	30	.433	5/10-5/20	.233	+ .200
Ingham Co., Dansville State Game Area #2	Harold Dykema [route changed]	4	21	.190	4/26-5/14		
Iron Co., T43N-R31W Channing	Ivan Thomson [repeat -Carl Dubovsky in '53]	27	30	.900	4/12-4/21	1.333	- .433
Isabella Co.,Mt.Pleasant	William Southern [exact route not covered '53]	59	39	1.513	5/10-5/12		
Kalamazoo #2 Alamo	Gladys A. Hall [repeat]	27	30	.900	5/9-5/15	.848	+ .052
Kalamazoo #1 Kalamazoo	Gladys A. Hall [repeat]	32	30	1.067	5/9-5/15	.889	+ .178
Kalamazoo #3 Augusta	Larry Caldwell [new]	11	33	.333	5/10-5/14		
Lake Co. Baldwin T17N, R12W	Philip Baumgras [new]	45	24	1.875	4/28-5/8		

Table 1 continued.

Locality of route	Observer	Total birds heard all trips	Total No.of stops all trips	Av.No. birds per stop per trip	Incl. dates	1953 Av.No. birds per stop per trip	Change
Livingston Co., Pinckney	Karl Ackermann [new]	15	36	.417	5/7-5/12		
Luce Co., Newberry McPhee's Landing	O. DeWaard [repeat 1953, Dr. Ammann]	14	16	.875	5/9-5/11	.818	+.057
Midland Co., Midland	Bruce Winchell [new]	39	21	1.857	4/29-5/17		
Newaygo Co. #1, Fremont	Esther Roosninck [new]	59	27	2.185	4/28-5/12		
Newaygo Co. #2, Fremont Bridgeton Rd.	Esther Roosninck [new]	44	18	2.444	4/29-5/12		
Ogemaw Co.,Greenwood Road	Lawrence Ryel [new]	40	27	1.481	5/10-5/12		
Ontonagon Co., Ewen N. Cemetery Rd.	Arthur & Irja Peters [new]	14	18	.778	4/29-5/19		
Otsego Co., Gaylord T29N, R2W	Otto Failing [repeat]	18	21	.857	4/22-5/6	.208	+.649
Presque Isle, Rogers City	Lewis Crosby [new]	13	21	.619	4/23-5/12		
Roscommon Co.,T22N;R4W	W. L. Palmer [repeat]	27	24	1.125	5/5-5/15	1.079	+.046
Roscommon Co.,T23N;R4W	W. L. Palmer [repeat]	24	22	1.091	4/29-5/12	1.600	-.509
Van Buren Co., Almena	G.A. Hall and W.A.Freyburger [repeat]	29	30	.967	5/8-5/15	1.273	-.306
		1000	944	1.059			

Table 1 continued

Locality of route	Observer	Total birds heard all trips	Total No.of stops all trips	Av.No. birds per stop per trip	Incl. dates	1953 Av.No. birds per stop per trip	Change
Wisconsin							
Langlade Co.,Ackley	F.D.Irving	25	39	.641	4/26-5/20	.833	-.192
Minnesota							
Wabasha Co.,* Beaver	Wm. H. Langley	2	32	.063	4/5-5/5	.444	-.381
Cook Co.,Grand Marais	Milton H. Stenlund	9	27	.333	5/17-5/26	.455	-.122
St.Louis Co., Duluth	P.B.Hofslund & J.K.Bronoel	21	15	1.400	5/6-5/9	.750	+.650
*Given as Winona Co. in 1953							

Table 2.--Woodcock Breeding Ground Summary Central-Northern States 1954

	Total Routes	Total stops all trips	Total birds all trips	Av.number birds per stop per trip
Michigan	36	944	1000	1.059
Wisconsin	1	39	25	.641
Minnesota	3	74	32	.432
Totals 1954	40	1057	1057	1.000
" 1953	37	866	672	.776

Change 22.4% increase

MASSACHUSETTS WOODCOCK STUDIES - 1954

William G. Sheldon

Massachusetts Cooperative Wildlife Research Unit

Cooperators in this project were Ethan Howard, Jr., Gardner Hobart and Herbert Maxfield.

The trapping and banding routine of former years in Massachusetts was continued on a somewhat reduced scale, thus completing five years of this phase of the studies. The results have corroborated findings of other years on the behavior pattern of male birds as reported in previous accounts.

More emphasis has been placed on summer studies, and nets were run from early July until late October in one location in Quabbin Reservation.

Results of an intensive two-year study of singing field characteristics in central Massachusetts is being prepared and will be summarized in next year's annual report.

Spring return of Woodcocks

Correlated with an extremely early spring, the vanguard of woodcock migrants arrived much earlier than usual. A "peenting" male was heard at dawn in late February. In spite of the early arrival of some woodcocks, the bulk of native birds did not arrive on the breeding grounds in Quabbin Reservation until the last few days in March. For five years, there has been a rapid buildup of performing males the last week in March regardless of how early or late the spring may have been.

Spring Trapping Results

One hundred and seventeen captures were made in the spring, of which 82 were new birds, 20 were returns and 15 were repeats. Three of the total were chicks, 8 were females and the balance males.

Returns of males.--A manuscript has been prepared analyzing the returns of singing males over a five-year period. It is now known that a minimum of 51 percent of the males captured in the spring of 1950 returned to breed in the spring of 1951. Results of this entire study will be published within the year.

During the spring of 1954 there was a total of 18 returns of males. Four of these were originally captured and banded in 1950, 2 in 1951, none in 1952, (but several of the returns of 1950 and 1951 were also caught in 1952) and 11 in 1953. Another of these, caught July 1953, in a mist net, was captured in the spring of 1954, using a singing field .8 miles away. A second return was that of a road-killed bird.

Of 16 singing males which returned, 4 were using the same singing sites at distances of from 3.9 to .2 miles from the capture sites of former years. The average distance separating the 1954 singing sites from fields used in other years was .85 miles.

Unusual behavior was demonstrated by one bird which has never been caught at the same singing field twice, either in the same year or in later years. Originally caught in 1951, this bird has been captured at five different singing sites as much as 2.6 miles apart. Another bird originally caught in 1950, although captured on the same site or sites several times, has been captured on five different sites, some separated by slightly over a mile.

Returns of females.--There is no certain evidence cited in the literature for the return of American woodcock hens to breeding grounds of previous years. Therefore two returns of hens which were recorded this year are of particular interest.

The first hen return was banded as a chick in 1951. She was recaptured this year in a decoy trap on April 8, approximately 500 yards from her original banding site. A distinguishing sex character was a bill of 74 mm. Examination of her cloaca suggested the bird to be in breeding condition. Females, apparently starting a clutch, have greatly enlarged cloacas which are much more conspicuous than those of males at this time of year. This record is of especial interest as evidence that female woodcocks tend to return to breed in the same area where they were hatched.

The second female return was that of a mature hen caught on three occasions in 1953 in the same funnel trap at intervals of several weeks. She was captured in the summer of 1954 in mid-August in a net 3/4 of a mile from her banding site, strongly suggesting she had returned to the same general area to breed.

Separate Singing Ground Study

Following up individual investigations of former years of the behavior of males as it might affect census techniques, Herbert Maxfield, a graduate student at Massachusetts State University, undertook a special study this year. The objective was to see how many male birds could be caught at one singing field. These birds were marked with airplane dope so that field identification would be possible. In addition, a record was kept of the number of males heard peenting or singing in the study area.

In contrast to the trapping grounds at Quabbin Reservation, Massachusetts, described in a previous report, the area selected is in the Connecticut River valley just on the western edge of the foothills at Amherst, Massachusetts. It is made up of extensive flat farmlands with a brook running along the eastern border. The only tree cover is on a narrow abandoned field of 17 acres approximately 600 yards long

and a little over 100 yards wide, planted to conifers. In addition, there is one large stand of alders, with some mixed growth, surrounded by very open land.

Woodcocks performed in both areas and could be heard from one listening spot. Three different males were caught at one site before the end of March by a cooperator. These might have been migrants. However, when Maxfield began work April 11, he captured three additional birds at the same site between April 11 and April 25. One of these three was later recaptured at the same site and one caught on April 11 was seen at its capture site April 13. In addition, two other males were caught at closely adjoining singing sites.

During 20 evenings of work between April 11 and May 20, birds heard peenting and flying varied from 1 to 4. On four evenings, no male was heard at the singing site where 6 had been captured, marked and released. On at least six evenings when only 1 bird was peenting and flying normally, one or two additional birds were heard peenting, but not flying. These observations demonstrate again erratic behavior of singing males, shifting of singing grounds, and overlapping territories.

In spite of the fact 8 birds were known to use the area, current census techniques in most instances would have recorded 3 by tabulating those "peenting." It is believed this was the best estimate since three singing sites were within the sound of one spot. Other birds were probably either migrants or visitors from singing grounds from more distant areas.

Annual Massachusetts Census

The details of the annual Massachusetts census are recorded elsewhere. Although a slight drop occurred in all the areas of census, it is believed this is misleading since vegetative changes are taking place rapidly in the Quabbin area, and it is probable the lower number of birds reflects the change of cover rather than a reduced population.

Cape Cod

Although no census was recorded, one observer reported hearing 8 singing males along 2 miles of road near Chatham, Cape Cod. Breeding areas on the Cape may be limited, but it is suspected that breeding birds are more abundant there than heretofore reported in the literature.

Predators

A Great Horned Owl's nest in the study area was kept under observation for a month. Three woodcocks were observed to be brought into the nest. Remains were only sufficient to identify one as male. It is probable that singing males are vulnerable to this species of owl which hunts most actively during crepuscular hours when the woodcocks are performing.

Summer Studies

Following up investigation of summer evening flights reported in the 1953 report, observations were begun July 1, 1954. Flights similar to those described last year took place, and nets were set up in the same 1/3 acre field used a year ago. As of October 20, 64 woodcocks were captured. Most were taken in the nets while some were trapped in blind traps placed in the bottom of two adjoining gravel pits.

Techniques.--Four or five Japanese mist nets, approximately 30 feet long and 12 feet high were set at strategic places on the periphery of the opening. The locations were changed often in accordance with that route of approach to the field used by most of the birds. The nets must be set tight. Often birds can be flushed into them after lighting. As during the last year, only about one out of three birds hitting the nets became entangled.

Possible reasons for flights.--At least one possible clue was discovered during the summer which might partially explain the attraction of this area for woodcocks. The site is a burn about 15 years old. The terrain is fairly flat and is now grown up to sprout growth about 20 feet high which is predominantly grey birch. Ground cover in the openings is largely low blueberry with a scattering of sweet-fern. The ground is littered with rotting logs which provide an ideal habitat for quantities of ants.

On July 1, a woodcock was observed at dusk to light in the netting field on a flat white-colored rock, and could be seen picking up insects which proved to be a small species of ant. Examination with a flashlight of other lighting spots invariably revealed a colony of ants.

Therefore, it is possible these crepuscular flights are at least partly dietary in purpose. It may be found that ants afford a valuable supplemental diet at this time of year.

Numbers of birds.--The largest number of birds seen lighting in or passing over the field in one evening was 19. More lit in the field in July than any other month. The average number of birds counted per evening between July 1 and August 10 was 7.7, August 1 to August 25, 3.0; and August 26 to September 30, 7.3. In September, far fewer birds lit in the field. Most were flying over at sufficient height to miss most of the nets. Accurate counts were made on only 40 nights throughout the summer. Based on these, it is estimated that from July 1 to September 30, between 500 and 600 separate observations of woodcocks were made.

Significance of bandings.--Thirty-one of the birds were banded and the remainder preserved as study specimens. Thirteen birds were banded at this site a year ago. Of 44 banded birds (including those of 1953) there was only one repeat and no returns with the exception of a hen caught elsewhere in 1953. One male bird banded on September 15 was found dead in a net on October 9. Originally the bird was caught in one of the blind traps set in an adjoining gravel pit.

These results strongly suggest that many different birds used this site. Lack of repeats further suggests there must be a number of other areas similarly utilized. If such is the case, the chances of getting repeats are remote. It may well be, therefore, that several hundred separate woodcocks were observed during the summer.

As yet, evening observations in other areas have not revealed similar concentrations. There is no doubt in the writer's mind that there are other areas of attraction, and it is hoped that more diligent exploration in another year will discover these. If such is the case, a large array of nets would yield considerable numbers of woodcocks.

Sexes.--Of 64 birds captured, there were 31 males, 22 females and the balance could have been of either sex. Sex was determined by bill length and examination of the primaries. Specimens have been checked internally. The results give a sex ratio of approximately 100 males : 71 females.

Most reports on woodcock sex ratios show a preponderance of females. It has been the observation of this writer during netting and trapping operations that females are less wary than males and appear to be of slower flight. A captured female can be placed on the ground in a flashlight beam and can be picked up by hand again readily, even if placed 20 feet away. It is seldom possible to do this with a male.

In 1953, all netted birds were males and actually it is believed that more males were lost from the nets than females. These observations simply suggest that females may well be more vulnerable to shooting as well as other methods of collecting. It is possible, therefore, reported sex ratios in the gunner's bag may not be a sufficiently representative sample to give the true picture of sex ratio.

Molting.--The first sign of molting observed during this summer work was of a female captured in 1953 on July 25. The first molting bird captured this year was on July 28. Various stages of molting were detected on most birds captured well into September. Based on the number of birds seen in the evenings, the evidence points to the beginning of a molt in late July with the height of the molt, especially wing feathers, between August 11 and August 25 when only an average of 3 birds were observed per evening. It is hoped that careful study of specimens will result in a method of recognizing juveniles of the year. Birds molting in September may well be young of the year. It was further observed that the last feathers to molt are the tail feathers. A bird netted on October 20 still retained a number of pin feathers on the underside of the tail. It would be very useful if a method could be found of distinguishing age by the tail feathers. With this in view, it is suggested that other investigators who have an opportunity to examine birds in the hunter's bag make an effort to carefully examine tail feathers.

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WILSON'S SNIPE WINTERING GROUND STUDIES, 1953-54

Chandler S. Robbins

U. S. Fish and Wildlife Service

Investigations were continued on the wintering ground of the Wilson's Snipe for the purpose of obtaining information pertinent to the management of this migratory game bird. These investigations, which were similar to those of the preceding year, included: (1) Organizing mid-winter snipe counts for the third year in the southern states for the purpose of obtaining an index of abundance; (2) Participation in and summarizing the results of these counts; (3) Trapping and banding wintering snipe in Alabama and Florida; and (4) Summarizing snipe abundance as recorded on the annual Christmas Bird Counts published in Audubon Field Notes and in other ornithological periodicals.

Wilson's Snipe Abundance Index.--Through the cooperation of State Game Departments, professional and amateur ornithologists and Fish and Wildlife Service personnel, 160 areas in the southern and central states were checked during the period January 20-24, 1954, for the purpose of obtaining an index to the wintering population. One hundred forty-four of the 160 reports included a specified amount of coverage on foot, and these have been selected for summarization in the present paper. There were also several excellent counts made from boats, but not enough from identical areas in 1953 and 1954 to yield significant comparisons. Snipe observed while the enumerators were driving have likewise been omitted from the present comparison.

Table 1 gives a summary by states of the number of snipe seen per hour of foot coverage in 1953 and 1954. The left half of the table contains data from the 67 areas which were covered in both years. The right half contains all foot-coverage data, including not only the 67 identical areas, but also 141 additional areas which were visited in one year but not in both. Although the right half of the table is based on the larger amount of coverage (445 hours in 1953 and 497 hours in 1954), the left half (with 249 and 256 hours, respectively), is considered to be the more reliable comparison.

No significant change in population between 1953 and 1954 is indicated by the reports from the 67 comparable areas. The large apparent increase indicated by the comparison of "all areas" was due primarily to the coverage in 1954 of three new areas with very high populations: 1,759 snipe observed in one day in Mississippi by N. C. Hutchison, and two Louisiana counts of 1125 and 670 by Joseph Withers.

Even when we consider only those areas which are covered both years, there is the danger that large increases or decreases in a few of the

best concentration areas may affect the total figures so heavily as to mask a more significant wide-spread trend. Therefore, a count was made of the total number of areas which showed an increase, the number that had a decrease, and the number that had less than a 25% change in either direction, between 1953 and 1954. The number of increases was 22; decreases, 24; no change, 21. This, of course, is further evidence that no measurable change had taken place.

Data from Christmas season counts.--Table 2 gives a five-year comparison of snipe recorded on the annual Christmas Bird Counts. Last year's table was based on 79 areas that were covered for six consecutive years and that reported snipe on one or more of these years. This year, by dropping the first two winters from the table, it has been possible to include 50 additional areas that were visited annually from 1949-50 through 1953-54. Coverage during the five-year period ranged from 5,556 party-hours in 1950-51 to 7,742 in 1953-54. Although this represents fifteen times as much effort as the winter snipe count, the Christmas count participants tally all species of birds and cover all habitats. Therefore, the number of snipe they record is much lower than the number observed on the winter snipe counts. The 67 comparable areas on the latter count had 4,851 snipe in 1953 and 4,457 in 1954; whereas the Christmas Count totals were only 758 and 2,157 for the same two years. The high 1954 tally was due to a concentration of 1,000 birds in one California area where they had not occurred in previous years. To keep this one area from having an undue influence on the grand total, a separate total has been given for Administrative Regions 2 through 5.

A count was made of the number of areas reporting increases and decreases, similar to that made for the winter snipe count; for this comparison, 183 areas which reported in both 1952-53 and 1953-54 were used (instead of just the 129 areas for which a five-year series was available). Eighty-seven areas had an increase; 52, a decrease; and 44, no change of as much as 25%.

In regions 2, 3, 4, and 5 the 1953-54 figures are close to the five-year average; and with the exception of Region 1 (distorted by the count of 1,000 snipe in one California area), there is no indication of any appreciable change in population.

Trapping and Banding of Snipe.--Japanese mist nets were operated two nights along the Mobile Bay Causeway, one night at Foley, Ala., and one night (with the assistance of U. S. Game Management Agent Jacob Wolfley) at Lake Jessup in Seminole County, Fla. Eleven snipe were banded at Foley, 20 at Lake Jessup, and 20 at Mobile. One of the 37 birds banded at Mobile the previous winter was also retrapped there. Up to the present time no recoveries have been received from the 135 snipe I have banded the past three years. I was told, however, that one of the birds banded at Lake Jessup in February 1953 had been shot there the following fall, but not reported to the banding office.

Table 1.--Winter snipe count - 2-year comparison based on coverage by foot only

State	Areas covered both years			All areas		
	Number of areas	Snipe per hour		Additional areas	Snipe per hour	
		1953	1954		1953	1954
California (Region I)	6	11.4	47.8	12	32.2	35.5
Arizona	2	11.1	2.1	0	11.1	2.1
Colorado	0	----	---	1	----	3.4
New Mexico	6	2.6	0.7	5	2.3	5.8
Texas	4	3.3	1.3	23	2.1	1.5
Utah	0	---	---	8	---	1.8
Total, (Region II)	12	2.7	0.9	37	2.0	0.8
Percent change, Region II			-67%			-60%
Alabama	2	0.5	1.5	22	8.9	1.7
Arkansas	5	0.8	1.3	7	2.8	3.0
Florida	8	6.5	3.1	9	6.6	4.6
Georgia	1	6.0	12.0	2	6.0	9.9
Kentucky	5	0.4	0.1	6	0.7	0.2
Louisiana	17	87.0	64.8	21	73.2	67.5
Mississippi	3	2.3	2.9	6	1.5	83.2
North Carolina	2	0.9	0.1	6	.7	.2
South Carolina	4	14.7	11.0	2	11.6	11.0
Tennessee	1	0	0	8	0	0.1
Virginia	0	---	----	1	----	2.3
Total (Region IV)	48	26.2	20.1	90	16.5	30.2
Percent change, Region IV			-23%			+ 83%
West Virginia (Region V)	1	4.2	4.7	2	4.2	4.4
TOTAL	67	19.5	17.5	141	15.0	24.1
Percent Change			-10%			+61%

Table 2.--Data from Christmas-season counts

Region		Number of areas	Snipe per 100 party hours					
			1949-50	1950-51	1951-52	1952-53	1953-54	5-year average
I	Wash.,Mont., Oreg.,Calif.	14	9	10	18	8	100	29.0
II	Wyom.,Utah, Colo.,Ariz.,N.Mex., Kansas, Okla., Texas	20	29	27	34	9	26	25.0
III	Minn., Wis., Mich., Ill., Ind., Ohio, Mo.	19	3	4	3	5	4	3.8
IV	La., Ky., Tenn., Miss., Ala., Va., N. C., S. C., Ga.,Fla.	41	12	21	28	14	22	19.4
V	Mass., R. I., Conn., N. Y., N. J., Pa., Del., Md., D.C., W.Va.	35	6	3	2	14	11	7.2
Total, Regions 2-5			12.0	12.3	13.2	12.4	13.2	
Grand Total		129	10.7	12.0	13.9	11.8	27.8	
Change from previous year: all areas				+12%	+16%	-14%	+136%	
	Regions 2-5			+ 2%	+ 7%	- 6%	+ 6%	

WILSON'S SNIPE POPULATIONS AND HUNTING PRESSURE IN THE NORTHWEST

Thomas D. Burleigh

U. S. Fish and Wildlife Service

After a long closed season, extending from 1940, Wilson's Snipe were legally hunted again in 1953 and 1954. To determine existing populations and hunting pressure in the northwestern states where hunting was permitted, a detailed study was made during the two weeks open season in Oregon and Washington in 1953, and in Oregon, Washington and northern California in 1954.

Oregon

Both in 1953 and 1954 the open season was the latter part of October. Suitable snipe habitat between Astoria and Tillamook was investigated in 1953, while in 1954 the coast region south of Tillamook, to Coos Bay, was included in this study. Open marshes suitable for snipe were found along this entire stretch of coast, the more extensive areas offering the most optimum conditions being at Coos Bay. Both years snipe were noted in rather small numbers, and the conclusion was reached that October was too early for the bulk of the birds breeding farther north to have come this far south. The snipe is a hardy species, and is probably influenced in its southward movement in the fall by weather conditions in the northern part of its breeding range.

Neither year was much interest in snipe hunting noted, and the total kill for the State for 1953 and 1954 was thought to be negligible.

Washington

In 1953 the two weeks open season was the latter half of November, in 1954 it was two weeks earlier, from the 1st through the 14th. The first year of this study suitable snipe habitat was investigated from Everett, south on the coast to Willapa Bay. The best area, both from the standpoint of the numbers of birds noted and interest in snipe hunting, was the open marsh on Grays Harbor, and for this reason the study was largely concentrated in this limited area in 1954. Both years snipe were recorded in far greater numbers than in Oregon, and in larger numbers in 1953 than in 1954, indicating an increase in transients from the north after the middle of November. Open marshes on Grays Harbor from which 30 to 40 birds could be flushed in late November, yielded a maximum of 12 to 15 birds when carefully searched in early November a year later. Assuming that weather is an important factor in the fall migration of this species, numbers noted in November could vary considerably from year to year, but it would appear now that in Washington the latter part of the month witnesses the arrival of the bulk of these birds from their northern breeding grounds.

There was relatively little interest in snipe hunting in 1953, although the few hunters contacted admitted little difficulty in getting their daily bag limit of 8 birds. In 1954 there was a noticeable increase in the number of snipe hunters in the field, but in no instance noted was the individual hunter successful in getting his bag limit. Neither year was the total kill large enough to cause any concern.

California

Field investigations were limited to the northern part of the State, and were concentrated to a large extent at Eureka, on Humboldt Bay, and at Los Banos, in the San Juaquin Valley. Humboldt Bay, with its extensive stretches of open marsh, would appear to be one of the major gathering places of the Wilson's Snipe on the Pacific coast. By early December suitable marshes supported large populations of birds, numbers noted being far in excess of those recorded on the Washington coast even in late November.

At Eureka, excellent snipe habitat was found. The bay is bordered by wide stretches of open marsh, and here snipe occurred in abundance. Despite the limited time spent in the field, I now feel that this area is one of the more important stopping places for the Wilson's Snipe on the West coast. Numbers noted each day exceeded considerably my figures for either Oregon or the state of Washington, and as favorable conditions for a species such as this prevail throughout the winter months, it is probable that many individuals present in December remain until the northward movement in the spring.

At Los Banos I found radically different conditions. Here the open marsh was largely artificial, being the result of deliberate over-irrigation. The primary object, of course, was to provide duck hunting, but the resulting marsh areas provided good snipe habitat. I found snipe less abundant than at Eureka, but present in good numbers and consider the San Joaquin Valley a suitable habitat for this species during the winter months.

Snipe hunting was found to be a comparatively popular sport in California, but as there was an equal abundance of waterfowl, particularly brant, on which the season opened the same day as that for snipe, hunting pressure was not excessive.

Actual numbers of snipe observed

Eureka (Humboldt Bay)		San Joaquin Valley	
December 6	73	December 9	23
" 7	87	" 11	47
" 14 PM*	59	" 12	56
" 15	112		
" 16	90		
" 17	79		

*afternoon only

SOME OBSERVATIONS ON NOCTURNAL ACTIVITY OF WILSON'S SNIPE - NEWFOUNDLAND (1953)

Leslie M. Tuck

Canadian Wildlife Service

Wilson's snipe (Capella gallinago delicata) are fairly common on the island of Newfoundland. These snipe have a territorial flight song which is most evident during the twilight hours of evening and morning. Since this period of flight song or "winnowing" appears to have a potential which can be measured in order to determine populations, a preliminary study of this phase of behavior was made in 1953. The principal objects of the study were to determine:

a. Range and audibility of the winnowing sound.
b. Extent of territorial or performing areas.
c. Durations of the winnowing periods and the factors controlling them.
d. Duration of the "peak intervals" when the maximum numbers of individuals are performing simultaneously.

This report includes data gathered during eight complete nights and eleven additional post-sunset periods. In all, 27 winnowing periods were studied. I was assisted in recording by W. I. Campbell.

Areas studied.--No special location in which to conduct the snipe studies this year was determined beforehand, although it was known that the site should be reasonably free of traffic disturbances. Three areas were chosen at random for comparative studies: Bay Bulls (near St. John's) - a sedge-alder marsh; Tompkin's (on the west coast) - a rich river bottom; and Salmonier (centre of the Avalon Peninsula) - a sedge-rush marsh bordering a river. Additional single post-sunset periods were studied in areas of similar composition. No attempt was made to sample the bog-marsh communities which also support a breeding population. The exact site at Bay Bulls from which data were recorded was determined by the only suitable spot to take the car off the road. The data at Tomkin's and Salmonier were obtained from the backyard (as it were) of the boarding houses we stayed in. These locations, as well as those of the additional areas studied, are recorded in our field notes in order to facilitate future comparative studies. Needless to say, we did not wander from these sites during actual recording.

Methods.--The period from sunset to sunrise was considered most promising for study. Activity after sunrise soon proved to be erratic and of little consequence. All-night studies commenced at 8 p.m. and were terminated around 6 a.m. (Newfoundland Daylight Time). When it was convenient to record only the post-sunset winnowing period, the sessions terminated around 11 p.m. by which time, unless it was a bright moonlight night, the earlier activity had ceased.

The data consists mainly of records of the number of snipe in the air at any one moment and the atmospheric conditions affecting this activity. It was generally feasible to record only at three and four-minute intervals but during erratic behavior the exact moment of an individual's "dropping-out" or "coming-up" was recorded. Actually, such individual behavior, although not always showing up in the charts of activity, was a check on the number of individuals performing during that period.

Some consideration was given to the procurement of an instrument for measuring light intensity during these studies but the proper electronic device was not available, nor was an instrument sufficiently sensitive to record minute atmospheric pressure changes. The only mechanical data obtained were those from regular readings of the thermometer at about five feet above ground level. Cloud cover was designated in units of ten as was the size of the moon on clear moonlight nights. No attempts were made to calculate ceiling; fog proved so disagreeable to both birds and observers alike that records were discontinued during dense fog. Actual times of sunrise and sunset and maximum hours of daylight during each day were obtained from Torbay Meteorological Station.

Observations were made only on windless nights, or those nearly so, when the performing snipe were audible. Thus, the periods were recorded under the following atmospheric conditions:

	Post-sunset	Pre-dawn
Clear moonlight	4	1
Clear with no moon	7	3
Overcast	8	4

Winnowing activity.--A snipe will winnow at any time of the day or night although extensive or continuous winnowing is only carried out during the twilight hours or on clear moonlight nights. I have recorded a bird winnowing for more than fifteen minutes during a cloudless sunny mid-day in late May (1952). If the day is overcast, particularly if overcast and warm, sporadic winnowing is almost certain to occur. Occasionally, during early May, the aerial activity at night may involve two or more birds flying closely together. I have also seen, on several occasions, two winnowing birds alight and commence to feed together. It is not known what roles the two sexes take in these aerial displays. On one occasion early in the season, I flushed three different individuals and each winnowed briefly which is an instance when outside influence may stimulate winnowing, at least to some extent.

This activity can be observed clearly during the day, early evening or on a bright moonlight night. The snipe flies erratically, swooping at more or less regular intervals of eight swoops to the minute (early May). Some variation in these intervals occurs and it is considered that the presence of other individuals may act as a stimulus in speeding up this activity. In such cases, either the rate of winnowing may be accelerated or the duration of the winnow may be increased. It is not considered that the number of snipe performing as tests indicate that when three or more individuals are involved approximately 30 of the winnows may synchronize. Nearly always, a peculiar vocal "yaking" is a prelude to

to a nocturnal flight. Sometimes, a bird will fly around erratically high over-head and not winnow at all.

When individual snipe were encountered, experiments were conducted under various conditions to determine the range of the sound. In most cases, under ideal conditions, the sound did not appear to carry even a half-mile in valleys and over rough terrain. In open terrain, it sometimes carried for more than a mile. It is considered that each locality may vary somewhat in the carrying capacity of the sound, due particularly to the acoustic properties of the surrounding terrain, and that atmospheric conditions may also affect this range.

The altitude at which performances take place varies but averages, I believe, around 300 feet on a clear night. The altitude of the performing individuals at any given moment may also be a factor to be considered in estimating the range of audibility.

Territory.--At Bay Bulls there appeared to be one pair of snipe to 10 acres of the area examined. Excluding unsuitable territory at Tomkin's, snipe appeared to be distributed at one pair to six acres. Five snipe were flushed at Salmonier from an area approximately three acres in extent. The performing territory of a snipe will include, if necessary, portions of the surrounding area which would not be suitable for feeding or nesting. A snipe will perform over a lake or over a heavily wooded area if those areas are on the fringe of its territory.

A snipe flies just as erratically when engaged in winnowing as it does when flushed. Yet, this apparently zig-zag aimless flight when winnowing appears to take place within definite boundaries which are more or less in the form of an elliptical spheroid.

Within this figure it appears to range back and forth appearing to be held within its boundaries most particularly when other individuals are performing nearby. The winnowing area is largest if a single snipe is performing although others are present in the area. When three or four individuals are performing in a comparatively small area a great deal of overlapping occurs, but this appears to occur only on the fringes of the territories.

Winnowing periods.--On clear moonlight nights, snipe may winnow continuously all through the night. On such nights, the most prolonged period when the maximum numbers are performing may be during the middle of the night. Normally, however, there are two distinct periods; one during the twilight hours of the evening, and the other during the twilight hours of the morning. These, which may be called the post-sunset and the pre-dawn periods, will be examined more carefully.

From an examination of 19 post-sunset periods there appears to be no hard and fast rule for their commencement. They may (according to the amount of sunshine during the day or the atmospheric conditions at the time) commence anywhere from one minute to 54 minutes after sunset.

The average commencement of ten periods after the third week in May was less than one-half hour after sunset. The duration of the post-sunset period is rarely less than one hour; when it is shorter, inclement weather seems to have influenced it, and if it extends to more than an hour and a half either moonlight or clear cloudless conditions appear to cause the extension. In each post-sunset period there also seems to be a period which may be termed the "peak interval" when the maximum number of individuals are performing simultaneously. Counts made during this peak interval show great possibilities of being an index of population.

The pre-dawn period seems to be much more definite in its commencement. Data on seven such periods show that three of them began at 4 a.m. exactly, and three others at 3:44 a.m., 3:45 a.m., and 3:46 a.m., respectively. The other was only three minutes off the 4 a.m. starting point. If any conclusions could be based on such scanty data, I would suggest that the rather consistent temperatures during the night might have some bearing on the consistency of the commencement of these periods. The pre-dawn period also shows a peak of maximum performance, but it appears to be much shorter and of less dependability than the post-sunset peak interval. There is remarkable consistency, under similar conditions, in the lengths of both post-sunset and pre-dawn periods.

When four or more birds are involved, activity during the pre-dawn peak interval is a less reliable indicator of population. Table 1 illustrates this.

Table 1.--Comparative percentages of periods of activity

	Post-sunset period	Pre-dawn
One bird	100%	100%
Two birds	82.5%	83%
Three birds	66%	63%
Four birds	48%	37%
Five birds	30%	17%

Table 1 gives percentages of periods during which different numbers of birds were active, averaged for six post-sunset periods and three pre-dawn periods followed through from May 5 to May 14. An examination of the accompanying winnowing charts (Figs. 1, 2, and 3) also indicates that the pre-dawn period, although comparatively equal in length and more dependable in its commencement has not the stability of the post-sunset period. This may be because there is a more dynamic change in light intensity during the post-sunset period, i.e. a change from maximum light to darkness in a minimum period. On May 12, at Tompkin's, for example, the post-sunset period was preceded by fifteen hours of light, whereas the predawn period was preceded by less than nine hours of darkness.

It is not certain that the number of snipe performing even during peak intervals is an indication of the number of males actually in the area, although the data obtained under nearly constant conditions at Tompkin's (Fig. 3) suggest that such is the case.

It was established at Bay Bulls that five different individuals performed at some time during each period, although the maximum performances during seven periods varied from three to six birds. It was concluded that the sixth performer, on April 30, may have been a migrant. Peak performances at Salmonier for eight periods involved from four to five birds. In each locality, however, it was possible to keep track of individual performers. As a further example, on May 27 at Bay Bulls, four individuals were performing sporadically from 9:30 to 10:05 p.m., and again from 10:20 to 10:45 p.m., but so quickly did some individual "go-up" and another "go-down" that only two individuals could be recorded in the air at any given interval during these periods. (This was a particularly erratic bout of shift-work, but our field notes record other instances). Consequently, the winnowing charts (Figs. 1 and 2) show only the number of individuals performing at a given moment rather than the average or highest number during a given interval. Moreover, it is during the peak interval that each performer will winnow, if only for a short time.

Table 2. Maximum numbers performing at any one interval during peak periods

Date	Location	Weather	Post-sunset	Pre-dawn
April 26	Bay Bulls	Clear moonlight	4	-
April 30	"	"	6	6
May 27	"	"	3	-
May 5	"	Overcast	4	-
May 26	"	"	5	3
May 9	Tompkin's	"	5	-
May 10	"	Clear no moon	5	-
May 11	"	"	5	5
May 12	"	"	5	5
May 13	"	"	5	5
May 14	"	"	5	-
May 23	Salmonier	Overcast	3	-
May 26	"	"	3	5
May 28	"	"	2	2
May 30	"	"	3	3
May 27	"	Clear moonlight	4	-

Table 3.--Conditions during post-sunset winnowing periods

Date	Possible hrs Nocturnal	Location	Weather	Total Period			Peak Period		
				Min. after sunset	Duration minutes	Temperature Range	Min. after sunset	Duration minutes	Temperature Range
April 26	9.8	Bay Bulls	Clear moonlight	10	Cont.	42° - 38°	55	Cont.	42° - 38°
April 30	9.6	"	" "	17	"	42° - 32°	60	"	39° - 32°
May 5	9.4	"	Overcast	1	87	45° - 40°	28	20	41°
May 9	9.2	Tompkins	"	52	87	?	58	55	?
May 10	9.1	"	Clear no moon	57	70	50° - 48°	62	18	49° - 48°
May 11	9.1	"	"	35	92	40° - 35°	68	27	36° - 35°
May 12	9.0	"	"	54	68	38° - 33°	65	28	37° - 33°
May 13	9.0	"	"	52	70	46° - 42°	72	29	45° - 43°
May 14	8.9	"	"	46	82	47° - 37°	58	13	42° - 40°
May 23	8.6	Salmonier	Overcast	16	45	43° - 42°	26	2	42°
May 26	8.5	Bay Bulls	"	18	63	40° - 38°	48	5	39°
May 26	8.5	Salmonier	"	23	41	47° - 44°	33	17	46° - 45°
May 27	8.4	Bay Bulls	Clear Moonlight	41	Cont.	37° - 35°	45	42	37° - 35°
May 27	8.4	Salmonier	"	20	"	37° - 32°	33	12	36° - 34°
May 28	8.4	"	Overcast	29	27	50° - 48°	31	25	50° - 49°
May 30	8.4	"	"	21	57	42° - 40°	36	1	41°
June 4	8.2	Goobies Pond	Clear no Moon	22	66	46° - 41°	47	11	43° - 41°
June 7	8.2	Dunns Pond	"	31	95	39° - 34°	89	19	35° - 34°
June 8	8.1	Goobies River	Overcast	34	62	?	49	18	?

Table 4.--Conditions during pre-dawn winnowing periods

Date	Possible hrs. Nocturnal	Location	Weather	Total Period			Peak Period		
				Min. before sunrise	Duration minutes	Temperature range	Min. before sunrise	Duration minutes	Temperature range
April 30	9.6	Bay Bulls	Clear moonlight	Cont.	Cont.	37° - 32°	95	5	32°
May 11	9.1	Tompkins	Clear no Moon	88	95	32° - ?	47	19	?
May 12	9.0	"	"	87	69	26° - ?	57	13	?
May 13	9.0	"	"	85	75	37° - 44°	55	15	36° - 43°
May 26	8.5	Bay Bulls	Overcast	84	59	36 °	70	25	36°
May 26	8.5	Salmonier	"	85	55	38° - 40°	70	12	38° - 39°
May 28	8.4	"	"	71	38	43° - 41°	52	4	42° - 41°
May 30	8.4	"	"	81	43	38° - 38°	73	3	38°

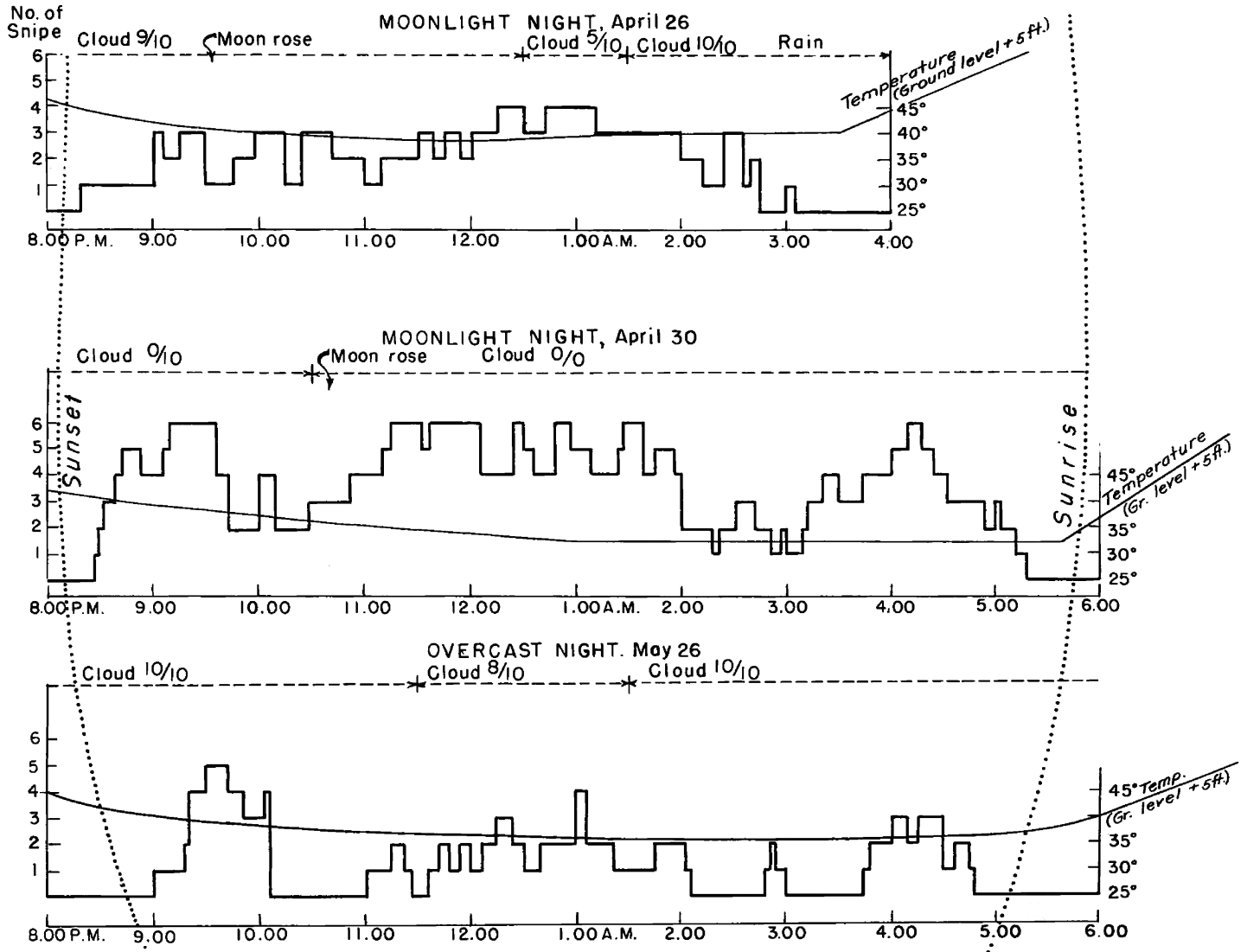

Figure 1. Snipe Winnowing at Bay Bulls, Newfoundland, 1953

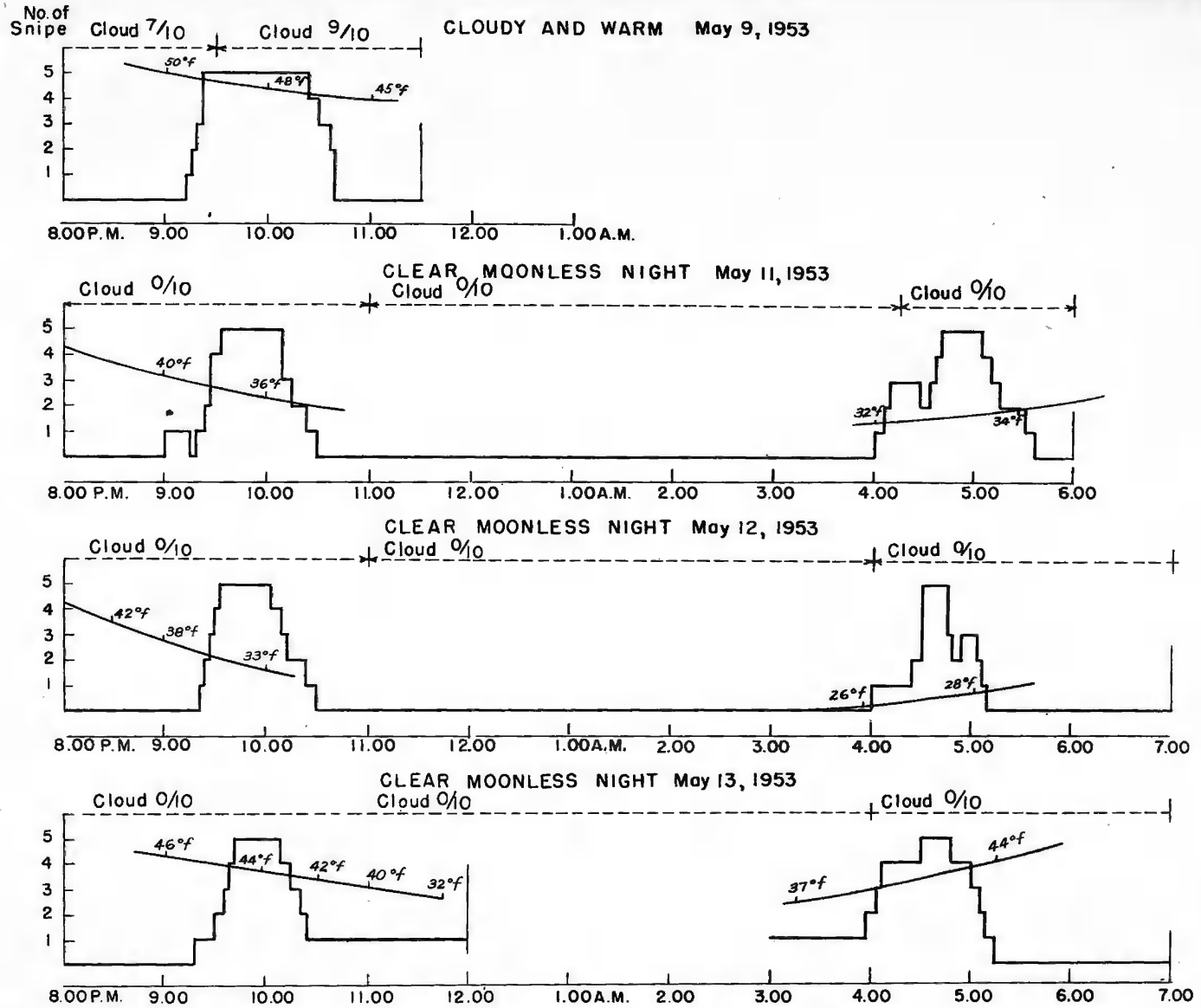

Figure 2. Snipe Winnowing at Tomkins, Newfoundland, 1953

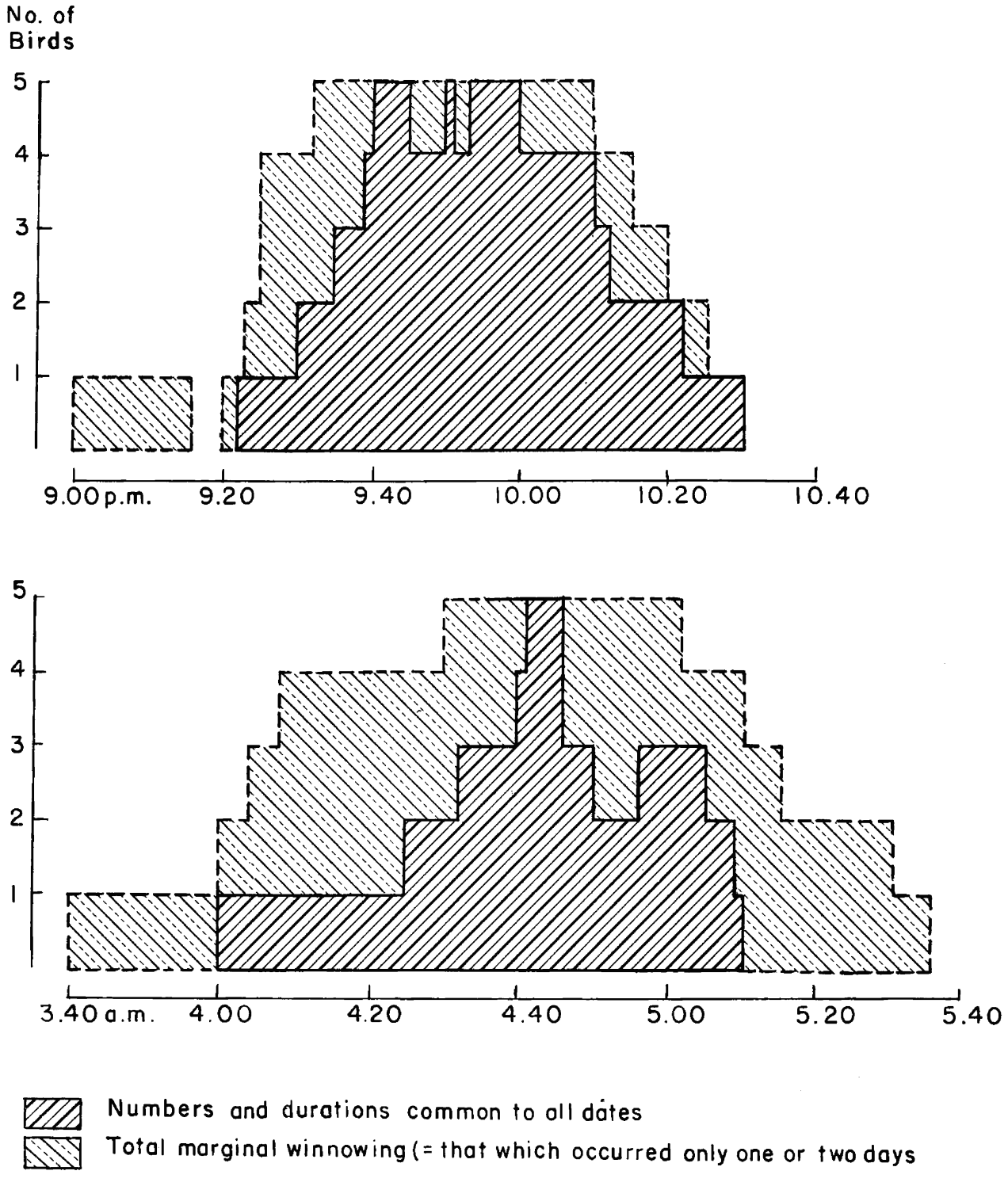

Figure 3. Comparison of post-sunset and pre-dawn winnowing at Tompkins, Newfoundland, May 11-13, 1943

DISTRIBUTION AND ABUNDANCE OF THE WILSON'S SNIPE IN WESTERN CANADA

Chandler S. Robbins

U. S. Fish and Wildlife Service

In order to obtain significant information on current changes in abundance of the Wilson's Snipe, and apply these intelligently to the hunting regulations it is necessary: (1) to have adequate methods for measuring changes in abundance on the breeding ground and/or on the wintering ground; (2) to know the geographical distribution of the species well enough so that census areas can be so chosen as to sample the whole population (giving proper weight to areas of highest concentration); and (3) to learn, through recoveries of banded birds and possible regional variation in plumage and measurements, the migration routes and wintering areas of the Wilson's Snipe that are associated with the various sections of the breeding range.

The summers of 1952 and 1953 were devoted to obtaining information on the measurement of breeding populations. During the summer of 1954 a survey was made of the breeding distribution and abundance of the snipe in western Canada. The itinerary was planned on the basis of our knowledge of the breeding distribution of this species. Nesting records and mid-summer observations from the files of the U. S. Fish and Wildlife Service were mapped according to the bird's abundance (when known). Mr. W. Earl Godfrey kindly added to the map other additional records available in the files of the National Museum of Canada. In planning the itinerary from the resulting map, an effort was made: (1) to visit several of the areas where the species had been reported as "common"; (2) to fill in some of the larger gaps on the map of breeding distribution; and (3) to make sample counts of winnowing birds in all of the more important ecological areas that were accessible by road. It was felt that by sampling the population in this way, the knowledge so gained could be applied in a general way to those vast tracts which could not be directly sampled with the time and facilities at hand. I am indebted to the Department of Soils of the University of Saskatchewan and to the Department of Extension of the University of Alberta for their kindness in making available soil maps of these provinces. Topographic maps furnished by the Canadian Wildlife Service proved indispensible in locating suitable habitat for snipe and in planning details of the itinerary; the splendid cooperation of this agency is gratefully acknowledged.

Weather Conditions

The month of April was exceptionally cold throughout all of western Canada, averaging from 10 to 18 degrees below normal in most of the areas covered on the trip. Calgary and Edmonton, Alta., broke and tied, respectively, the lowest mean April temperature on record for the present century. Cold weather continued to a lesser extent in May, most areas being 2 to 6 degrees below the May average. More than a dozen Alberta

stations reported temperatures below zero on the first. Average temperatures for May ranged from 2 to 6 degrees below normal in the southern two-thirds of the Prairie Provinces. June was 1 to 4 degrees below normal in this same area, and during July temperature records were finally near their average values for that month.

Precipitation in the Prairie Provinces had been very light in April, and spotty in May, but was heavy in June and July. It was very dry in the Northwest Territories until July, when moderate rainfall fell over most of that area. I observed rain (varying from light sprinkles to hard storms) on 30 of the 33 days of my snipe investigations in western Canada.

The cold weather probably delayed the nesting activities of the Wilson's Snipe as well as their arrival on their breeding grounds. Snipe were still winnowing in southern Yukon on July 28. Drought conditions in April and extensive flooding over large areas, especially in eastern Saskatchewan and southwestern Manitoba, in June and July must have interfered with nesting activities of the snipe. With no previous experience in that area and with very few definite reports of local observers to go on, it has not been possible to evaluate the effects of this summer's extreme weather conditions.

Itinerary

Figure 1 shows the itinerary, starting on July 2 (the start of the trip having been unavoidably delayed) in southeastern Manitoba, proceeding westward through Manitoba, southern Saskatchewan and southern Alberta, then north to the vicinity of Edmonton and finally to Great Slave Lake in Northwest Territories and via the Alaska Highway to Whitehorse, Yukon. Pre-dawn winnowing counts were made each day that weather conditions permitted, and evening counts were also made in some areas. These winnowing count localities are shown as large black spots on the map (Fig. 1). Associated with each spot is the number of snipe heard winnowing at each location. At many of these locations no snipe were recorded in the pre-dawn listening period. In each case, however, the counts were made in areas selected in advance by consulting topographic maps; so the negative results are believed to be a significant indicator of local scarcity. Snipe recorded at times other than the peak winnowing period are not entered on the map as they have no comparative value.

Distribution and Abundance

Figure 2 shows our present knowledge of the distribution and abundance on the Wilson's Snipe in the Canadian portion of its breeding range. A solid black circle denotes a population of more than five pairs (or status reported as "common); a circle with a heavy outline stands for 2 to 5 pairs (or status reported as "fairly common"); and a light-rimmed circle denotes a single pair per locality (or a report not specifying the number seen). All June and July reports have been included in the map, as well as all nest records. Observations for May and August (unless referring to an actual nest or young birds) have been omitted from the map to eliminate possible migrants and wandering birds. The shading in western

Canada is an attempt to interpret our present knowledge of snipe abundance in terms of ecological regions. The cross-hatched section to the north is the forest-tundra transition zone. Next under this is the boreal forest or "bush," with the narrow band of aspen parklands designated by hatching in the opposite direction. Finally, in the extreme south is the grassland. (Classification is from Native Trees of Canada, Dominion Forest Service, Bulletin 61, 1949). Tundra areas and mountain areas above timberline have been left without shading, as has most of British Columbia. There is too little information on snipe abundance in the latter province to permit any correlations with the complex of ecological areas.

Habitat Appraisal

I believe that instability of the water level may be a primary factor contributing to the scarcity of the snipe as a breeding bird in the southern parts of the Prairie Provinces of Canada. The plains of southern Saskatchewan and Alberta are characterized by relatively high winds and warm days. The resulting high rate of evaporation causes shallow marshes to go dry periodically. During rainy spells the pot-holes flood the surrounding vegetation and leave little area for snipe to feed; then, during a period of dry weather the water recedes beyond the vegetation so snipe would be forced to feed in the open (which they usually are reluctant to do). As will be seen on the map of snipe distribution in western Canada (Fig.2), there is not a single locality in the southern half of Saskatchewan or the southern third of Alberta where the Wilson's Snipe has been recorded as a common breeder.

In southern Manitoba, on the other hand, conditions are more comparable with those existing in central and northern Alberta and northern Saskatchewan. Evaporation is less. We know of seven localities in southern Manitoba where snipe are recorded as common breeders (more than 5 pairs per locality). Four of these areas were under flood at the time of my visit--an unusually severe flood resulting from torrential rains in southeastern Saskatchewan and southwestern Manitoba in late June and early July. I checked two of the three other areas, both of which were marshes along the shore of Lake Winnipeg. The water level in this lake is quite stable. The limiting factor here, apparently, is the small amount of marsh habitat.

In the Parklands, conditions are more favorable than in the grass-lands, but snipe are still very local. Floods in the Parklands of eastern Saskatchewan and Manitoba made it impossible to appraise the situation in those provinces this year. In the vicinity of Edmonton, Alberta, however, snipe were found to be locally common around the borders of shallow marshes in the Cooking Lake Highlands.

A few miles to the north of this the 'bush' begins. This is a broad belt, 300 to 500 miles in width (north-south), of mixed deciduous-evergreen, boreal forest with very few open fields. Muskegs and sedge bogs are said to be common, but the relatively few that were close to

the highways were, for the most part, unsuitable for snipe; the vegetation was too dense.

In southern Yukon, snipe habitat is very much restricted. Most of the lakes have steep banks and little emergent vegetation. Snipe were found to be very local, and were not common anywhere.

Although I did not go to Churchill, Manitoba, correspondence from two other parties who were in that area in the summer of 1954, indicates that the Wilson's Snipe is a much commoner nesting bird there, and at other points along the railroad from Hudson Bay, Sask., to Churchill, than anywhere in the boreal forest or prairie country that I had visited. On June 23, Theodore R. Hake recorded no less than 24 winnowing birds from 5 to 11 miles south of Churchill along the Canadian National Railroad. Three others were heard over the townsite four days later. C. K. Schoenbauer and J.H. Criswell, who were at Churchill from June 16 to June 28, reported hearing winnowing snipe at the town of Hudson Bay as well as at Churchill but they did not keep records on all of their observations. Previous observations on file from northern Manitoba also show consistently high counts of snipe.

Except for the observations from the forest-tundra transition area in the vicinity of Churchill, Manitoba, no snipe concentrations have been recorded in western Canada comparable with those in eastern New Brunswick, Prince Edward Island and Newfoundland. Only 8 of the 23 winnowing counts from western Canada (Fig.1) yielded any snipe at all. The maximum number per route was 8 and the mean of those that included one or more birds was about 4. By way of comparison, the average number of snipe recorded on 3 comparable routes in the vicinity of Sackville, New Brunswick in 1953, was 19 (Jolicure-Aulac), 16 (Cookville), and 20 (Midgic). Since all counts were made personally and since average weather conditions were comparable, the only important difference is in dates of coverage (May 28 to June 16 in New Brunswick; July 3 to July 28 in western Canada). Unfortunately, there are insufficient data at hand to determine: (1) the normal difference in nesting dates between New Brunswick and the various parts of western Canada that were included in these investigations; (2) the amount of delay in the 1954 nesting season as result of unseasonably cold weather; and (3) the extent to which renesting may have been attempted as result of flooding. The repetition of counts in some of the same areas at the height of the winnowing period in two or three subsequent years would make possible a still better comparison between the snipe populations in the Prairie Provinces and those in the Maritimes.

It appears likely, then, that the important snipe breeding areas of western Canada are in the forest-tundra transition area in northern Manitoba, northeastern Saskatchewan and the Northwest Territories rather than in the prairie, parklands or boreal forest zones. If this is later substantiated, then the primary factors controlling the greater part of the snipe reproduction in western Canada would be weather conditions and natural predation. Drainage and other human activities, although they may have been responsible for reducing the breeding population of snipe in the Prairie Provinces in years past would not at the present time present any appreciable threat toward further depleting the population.

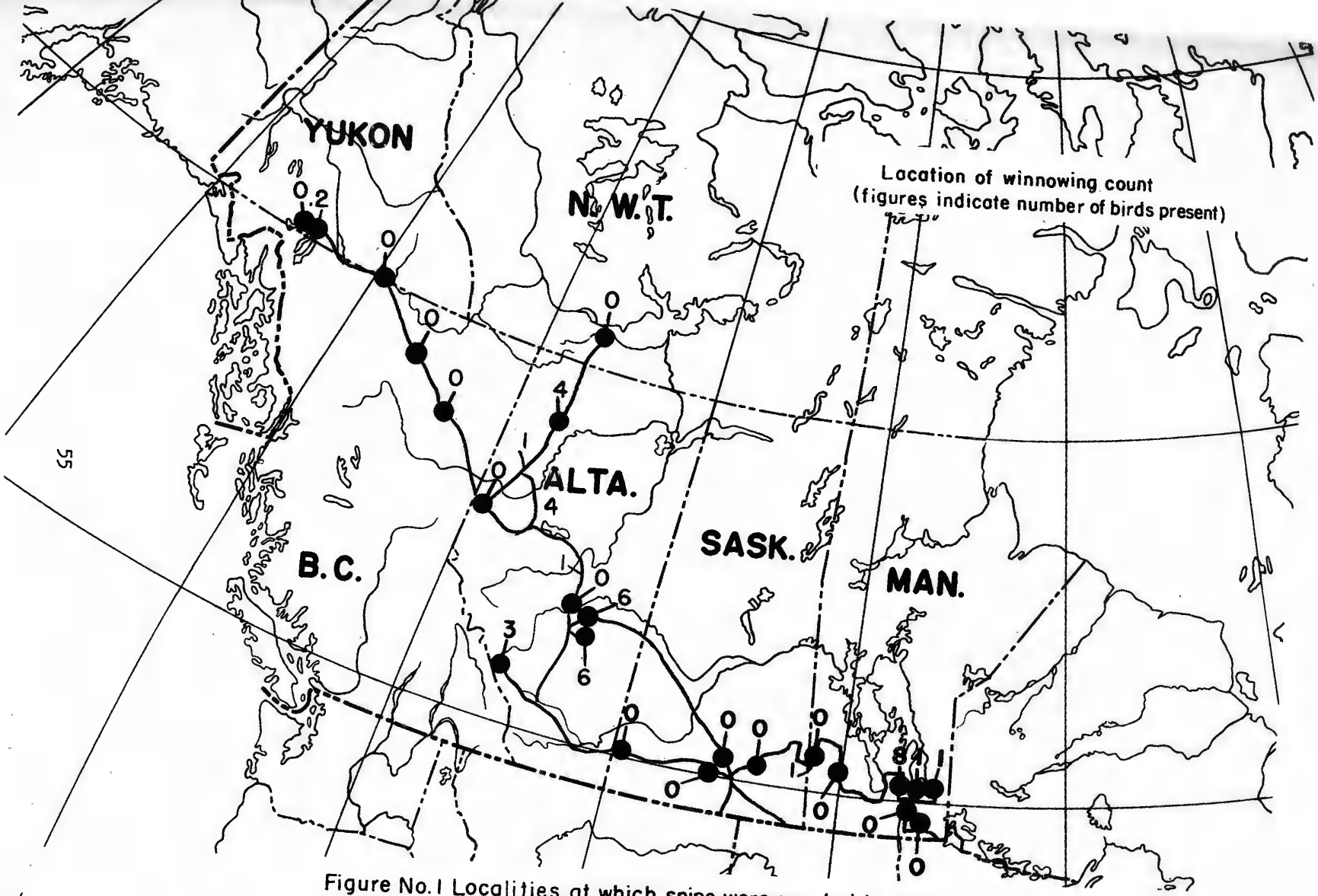

Figure No. 1 Localities at which snipe were counted in 1954

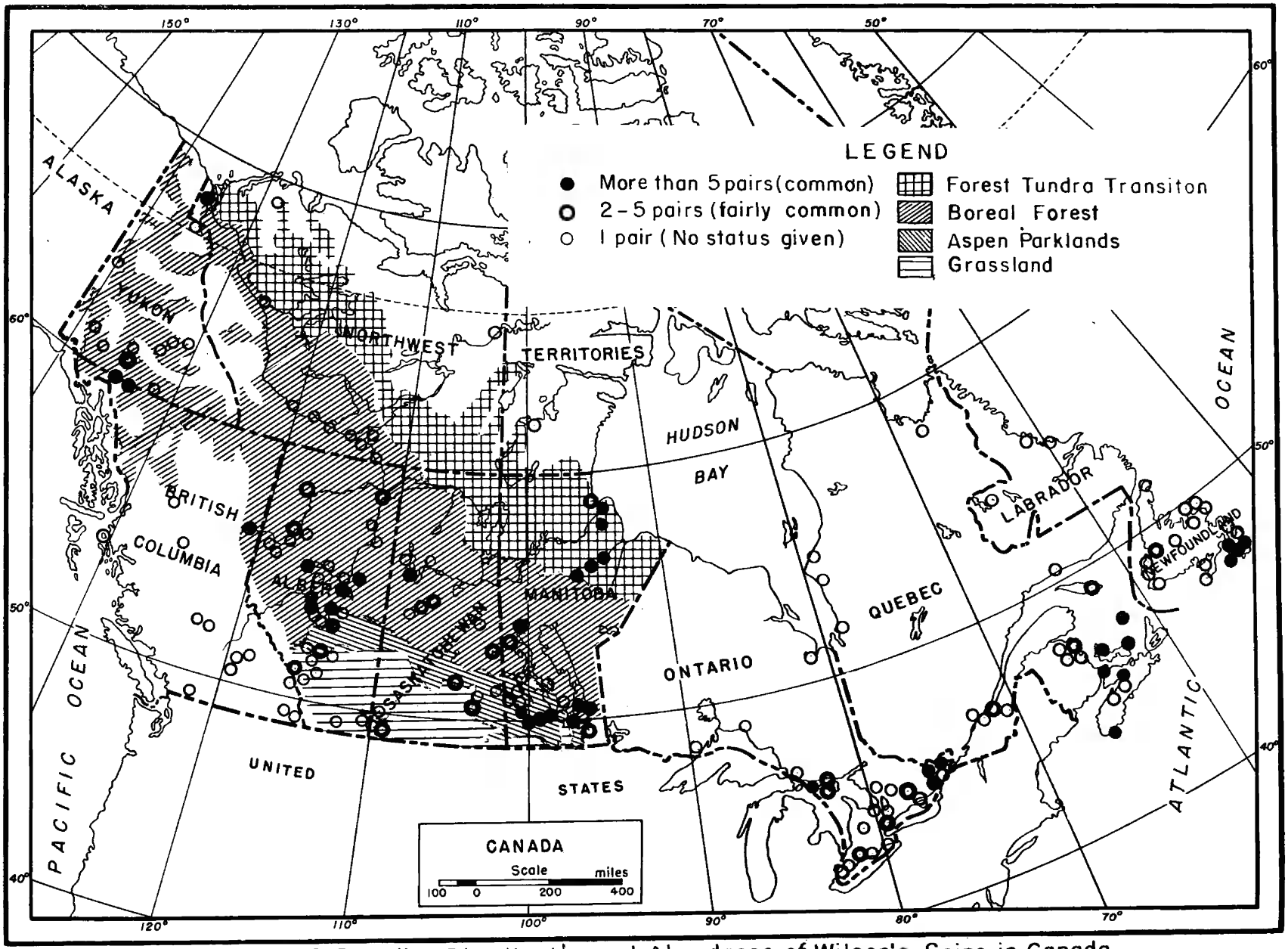

Figure No.2. Breeding Distribution and Abundance of Wilson's Snipe in Canada

Summary

1. An extensive field check was made of snipe habitat in those parts of western Canada (exclusing most of British Columbia) which are accessible by road.

2. Nesting snipe were found to be very scarce in the whole Short-grass Prairie region, widely distributed and locally common in the Parklands, local and uncommon in the Boreal Forest country, and consistently common in the only area of forest-tundra transition for which data are available.

3. If further investigations confirm that the area of greatest abundance is in the forest-tundra transition, then weather conditions and predation appear to be the major factors influencing the breeding snipe population -- habitat conditions remaining fairly stable.

4. Although drainage and other human activities may have been responsible in the past for reduction of the population of nesting snipe in the southern part of the Prairie Provinces, the population now in that area is so low and scattered that no appreciable further threat is imposed by human activities if, as now seems likely, the principal nesting populations are not there but in the North.

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SORA RAIL POPULATIONS IN ALBERTA, 1953-1954

Allen G. Smith

U. S. Fish and Wildlife Service

Since 1947, the U. S. Fish and Wildlife Service in cooperation with the Canadian Wildlife Service and the individual provincial Game Branches has been conducting joint waterfowl investigations in the Prairie Provinces of Canada. In Alberta, these surveys began as ground studies utilizing extensive roadside transects as a means of appraising waterfowl breeding populations and production. This was later supplemented by the use of an aircraft. Ground transects as such were then abandoned and intensive ground studies of selected areas within the various habitat types were substituted.

In the past, we have repeatedly been impressed by the numbers of sora rail, Porzana carolina, observed during field studies of ducks and geese. Until 1953, however, no particular effort was made to measure this population because of the press of other duties. Last year, while in the process of mapping the vegetation of each special study area as well as the details of emergent and submergent plant growth of each water area, the author made a count of the rails seen or heard on or near these water bodies. The results were so surprising as to warrant further work on this species. No detailed survey of the province of Alberta was possible. Nevertheless, data collected on the special study areas, which are representative of parkland and prairie habitats in that province, is presented here with the feeling that it may be of some value considering the paucity of information now available on this game species.

Sora rail observations were made in 1953 by Messrs. Wayne Heuer, U. S. Fish and Wildlife Service, Jack Millar, Alberta Game Branch, and the author; in 1954, by Messrs. Wayne Heuer, Dennis Weisser of the Alberta Game Branch, and Harry Webster and David Hurst of the Canadian Wildlife Service.

No effort is made here to offer the census method utilized in this study as the best available, nor should it be implied that the projection of the population figures observed on small areas, to larger areas is a biologically sound and tested method of ascertaining the resident sora rail populations over the entire province of Alberta. At best, it would merely be an index figure, open for adjustments or corrections as better methods are devised and more detailed observations over larger portions of the range of this species are completed.

Methods of Study

For purposes of our waterfowl investigations, the province of Alberta has been divided into four vegetative strata, following the

method used by W. E. D. Halliday in his "A Forest Classification for Canada," Ottawa, Canada, 1937. Stratum C, the semi-arid prairies of extreme southern Alberta, is characterized by a short-grass plain, the northern extension of the Upper Sonoran Life Zone. Stratum A, which extends roughly from the latitude of Lethbridge to Red Deer is made up of the mixed grass prairie, with a higher annual precipitation than the stratum to the south. In Stratum B, the parklands, we find a transitional zone, where an interspersion of aspen and grasslands give a park-like appearance to the countryside. This major Alberta waterfowl area comprises 65,000 square miles and is bordered on the west and north by the closed northern coniferous forest, Stratum D.

The rail studies discussed here were made only on special study areas within Stratum A and B, during the period from May 1 to August 1, 1953 and 1954. The two study areas in Stratum B, the parklands, were located in the northeastern and the southwestern edges of this vegetative type. The study area in Stratum A was located east of Calgary in the west-central portion of this particular stratum.

The method used in collecting rail population data in 1953 was to approach each pothole, toss a few rocks into the center and/or the edges and wait for the rails to make their loud and distinctive "keek." Later in the season, after the broods are moving about in the marsh, it was also possible to count numbers of broods, if not brood sizes, as the young have a decidedly different cry than does the adult. Because of the time element involved and the poor success resulting, little effort need be made to count sora rail in early May as they prefer to remain silent when disturbed. If time were of no account, long hours of waiting at each area would, however, result in an observer being able to record their spring 'song'.

In 1954, less effort could be expended on this study, but on the two parkland study areas, counts of rails were made by the ground crews while taking regular waterfowl population and brood counts of each water area.

Results

Utilizing the method described above, it was surprising how consistent the population densities of rail were in both parklands and prairies in 1953. Small potholes invariably contained one pair each, larger areas two or three. Lake shores seldom attracted them. Later in the season, as smaller areas dried, there was an apparent movement of adults and young from these areas to those containing water.

During the period of breeding activities, laying and incubation, but prior to the hatch, the average population density of sora rails per pothole in both Stratum A and B was one pair per pothole. Aerial and ground surveys of both prairies and parklands have shown our study areas to be representative samples of the vegetative stratum in which they are located. Fluctuations of waterfowl populations on these study areas have also been generally consistent with fluctuations in the entire stratum. If for the sake of argument we can assume for purposes of this report, that these areas

are in like manner representative of sora rail habitats throughout the stratum involved, we find rather interesting population indices for Alberta.

One of our parkland study areas (of 3.625 square miles) contained 54 breeding pairs of sora rails per square mile in 1953 and 54 water areas per square mile. Another parkland study area (of 6.375 square miles) contained 32 sora rail pairs per square mile and 32 water areas per square mile. In the case of a prairie study area of 3,125 square miles both sora rail pairs and water areas were observed to be 18 per square mile.

In attempting to expand these limited rail populations over a larger area, we find that our aerial surveys show that for the entire area of Stratum B, the water area density averaged 20.65 water areas per square mile in May. If we use this figure to establish an index for sora rails, in the entire area of Stratum B (26,100 square miles) then we might interpret it to mean that the average density of rails was also 20.65 pairs per square mile or 539,000 pairs in the entire stratum of aspen parkland.

In like manner, we found that in May the prairies (Stratum A, 22,088 square miles) showed an average water area density of 16.73 ponds per square mile or 16.73 pairs of rail per square mile, a total of 370,000 pairs in the entire stratum. This is a total of 909,000 sora rail pairs in an area of 48,188 square miles of prairie and parkland in Alberta in 1953. Surprisingly enough this index figure is only about 50,000 pairs less than the 1953 waterfowl breeding pair index for the same area.

According to the available literature, the clutch size of the sora rail ranges from 6 to 16 eggs. If we assume that each pair raised two young to maturity, then 1,818,000 adults would produce the same number of young or a total of 3,636,000 birds available for the fall flight. If only 50 percent of the adult pairs succeeded in raising 2 young per pair, then 454,500 pairs would have produced 909,000 young or a total of 2,727,000 birds available for migration. These figures are surprising, but until further studies are made which can refine our methods, our deductions are still in the realm of untested suppositions.

During the summer of 1954, these studies were continued on the two parkland study areas with rather startling results. It is not known at this time whether rail populations are in any way cyclic, subjected to excessive reductions in populations periodically or whether they shift about appreciably on their breeding grounds. We do know that drastic reductions occurred in the populations on the same study areas, however.

In one area where we had found 54 rail pairs and 54 water areas in 1953, we observed only 27.5 pairs of rails and 54 water areas per

square mile in 1954, a reduction of 49%. In a second area, where 32 pairs of rails and 32 water areas per square mile were recorded last year, 2.98 pairs of rails and 30.7 water areas per square mile were found this year. This is an even greater reduction, 90.7%.

Based on general observations over the past eight years, it would seem that there has been a reoccurring rise and fall of sora rail numbers in Alberta. In 1948 during banding operations, it was most apparent on the prairies that this species was exceedingly abundant. Not until 1953, five years later, did a comparable buildup in populations become so apparent. However, as this study only began in 1953, there are still too few data on which to base very definite conclusions as to fluctuation in populations of this tiny game bird in the northern prairie region.

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